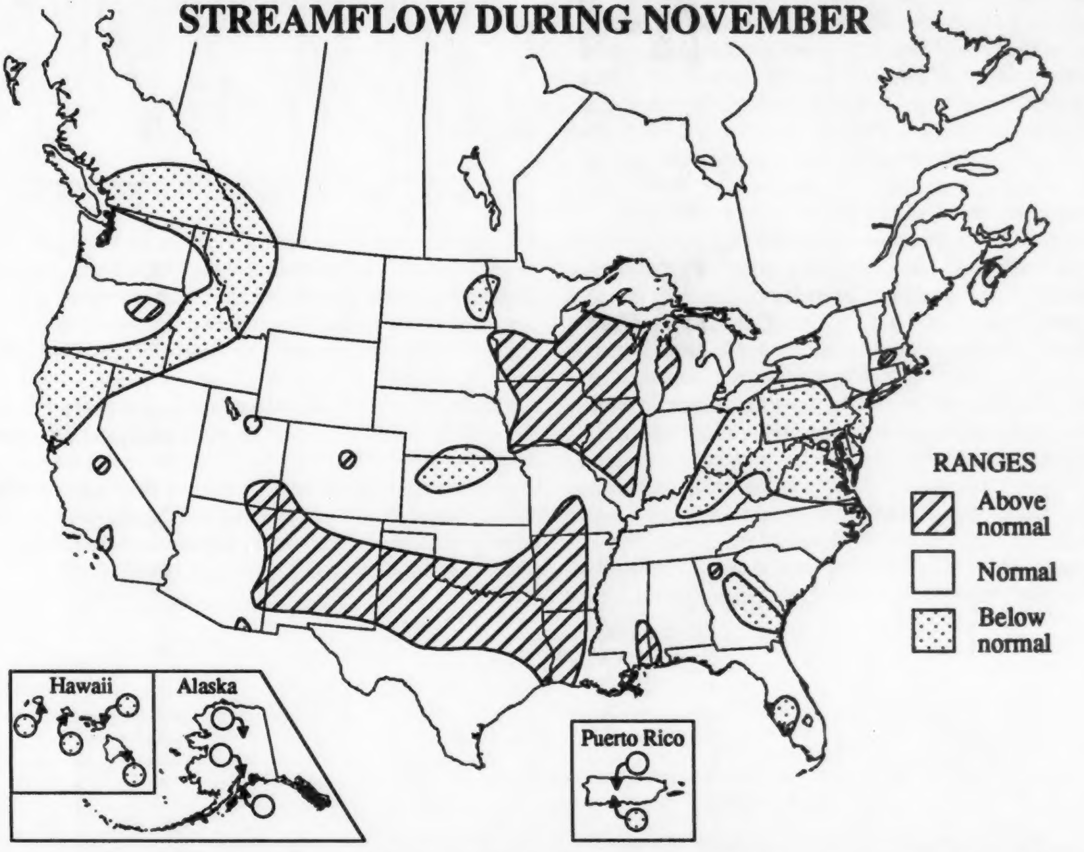
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

NOVEMBER 1991

STREAMFLOW DURING NOVEMBER



Drought continued to affect parts of the United States and southern Canada, with the largest areas of below-normal range streamflow located in the West and the East. The contents of the New York City Reservoir System increased, rising slightly from October to November but were only 72 percent of the long-term average for the end of November. In California, total streamflow, reservoir contents, and ground-water levels remained well-below average.

Streamflow was in the normal to above-normal range at 77 percent of the index stations in the United States, southern Canada, and Puerto Rico during November, compared with 70 percent of stations in those ranges during October. Below-normal range streamflow occurred in 12 percent of the area of the conterminous United States and southern Canada during November, compared with 23 percent during October. Total November flow for the 173 reporting index stations in the conterminous United States and southern Canada was 1 percent below median, after a 15 percent increase from last month.

The combined flow of the 3 largest rivers in the lower 48 States--Mississippi, St. Lawrence, and Columbia--averaged 4 percent above median and in the normal range, after a 33 percent decrease in flow from October to November, when flow was in the below-normal range.

Month-end index reservoir contents were in the below-average range at 32 of 99 reporting sites, compared with 33 of 100 at the end of October. Contents were in the above-average range at 37 reservoirs compared with 38 last month. Four reservoirs had less than 10 percent of normal maximum contents.

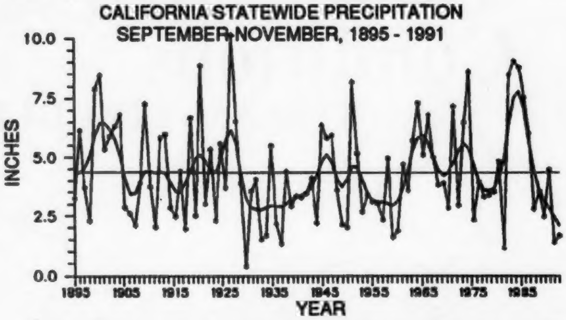
Mean November elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were above median on Lake Superior, below median on Lake Huron and Lake Erie, and in the below-normal range on Lake Ontario.

Utah's Great Salt Lake rose 0.20 foot, ending the month at 4,201.60 feet above National Geodetic Vertical Datum.

Streamflow was below median in the Atlantic Slope, Ohio River, the Great and other closed, Pacific Slope, and Columbia River basins, and above median in the other basins. Streamflow decreased from that for October only in the St. Lawrence River and Pacific Slope basins.

SURFACE-WATER CONDITIONS DURING NOVEMBER 1991

November streamflow declined from that for October at 45 index stations, remained unchanged at 3 index station, and increased at 143 index stations. (Data for the North Fork American River at North Fork Dam, California, were not available.) Drought continued to affect parts of the United States and southern Canada, with the largest areas of below-normal range streamflow located in the West and the East. The contents of the New York City Reservoir System increased, rising slightly from 48 percent of capacity at the end of October to 51 percent of capacity at the end of November (only 72 percent of the long-term average for the end of November). In California, total streamflow, reservoir contents, and ground-water levels remained well-below average. Total streamflow for November at the five reporting index stations in California was 57 percent below median after declining by 5 percent from that for October. The persistence and severity of the drought in California is shown by the following: (1) since the end of November 1990 (the most recent month of above-median streamflow), the cumulative streamflow deficit at the six index stations has gone from about 68 percent of a median year of runoff to about 115 percent of a median year of runoff—about 47 percent of a median year of runoff was "lost" in the last 12 months; (2) the seasonal lows in combined storage for six large index reservoirs have generally declined steadily since 1986, bottoming out at 69, 53, 43, 45, and 33 percent of capacity, with combined storage currently at 32 percent of capacity with the winter precipitation season due to start in December. According to the *Climate Variations Bulletin* (National Climatic Data Center, NOAA), California, which had a 1991 precipitation rank of eighth driest, has had near to much below-normal precipitation for the last six autumns (September-November). The last two autumns have been very dry, and the filtered curve has reached alarmingly low levels. (See graph below.)



Streamflow was in the normal to above-normal range at 77 percent of the 191 index stations in the United States, southern Canada, and Puerto Rico during November, compared with 70 percent of stations in those ranges during October, and 80 percent of stations in those ranges during November 1990. Below-normal range streamflow occurred in 12 percent of the area of the conterminous United States and southern Canada during November, compared with 23 percent during October, and 23 percent during November 1990. Total November flow of 441,000 cubic feet per second (ft^3/s) for the 173 reporting index stations in the conterminous United States and southern Canada was 1 percent below median, after a 15 percent increase from last month, and 20 percent less than flow during November 1990.

(Continued on page 4)

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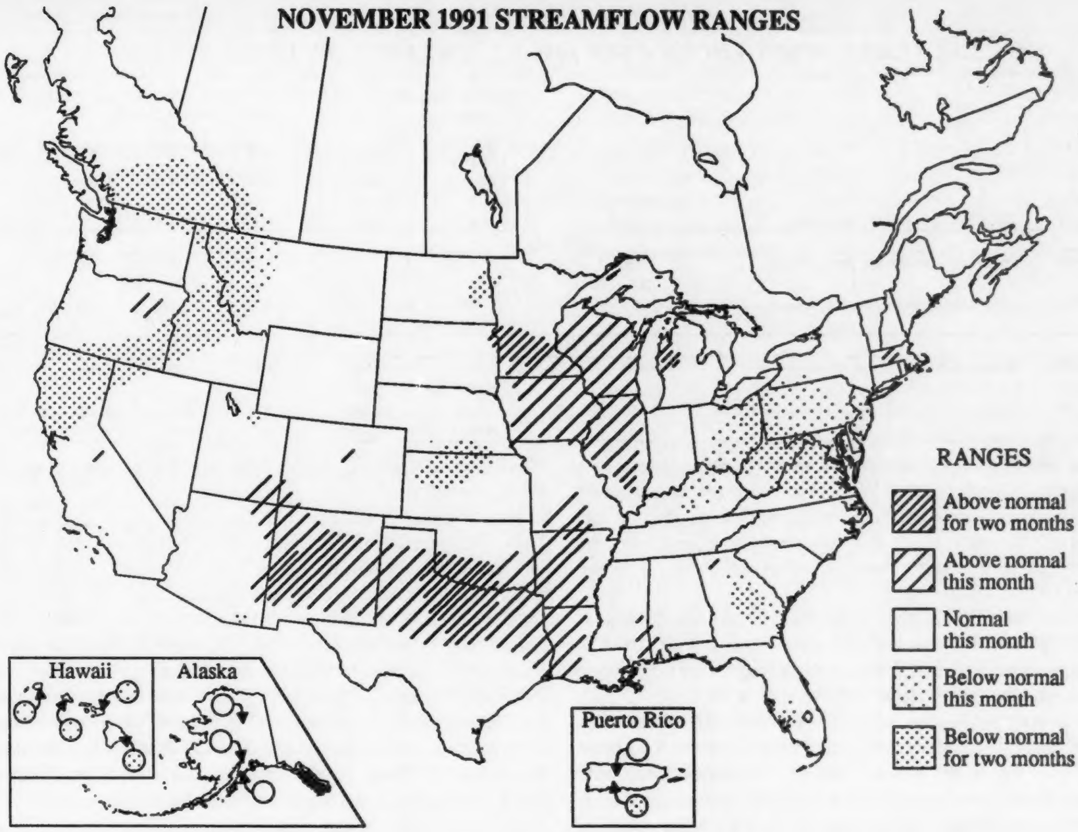
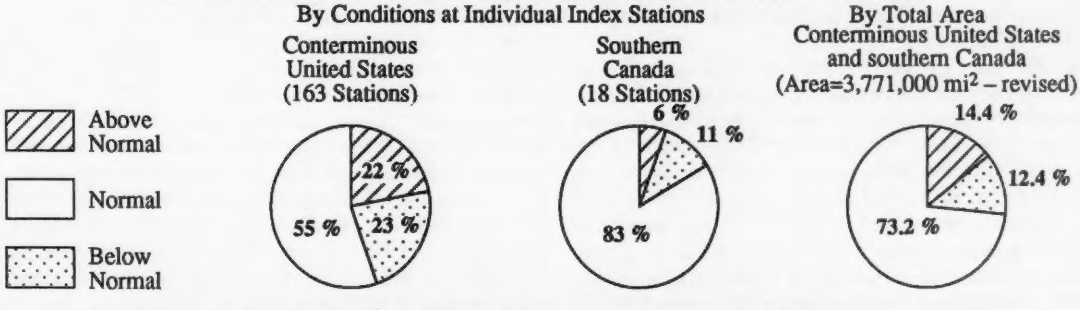
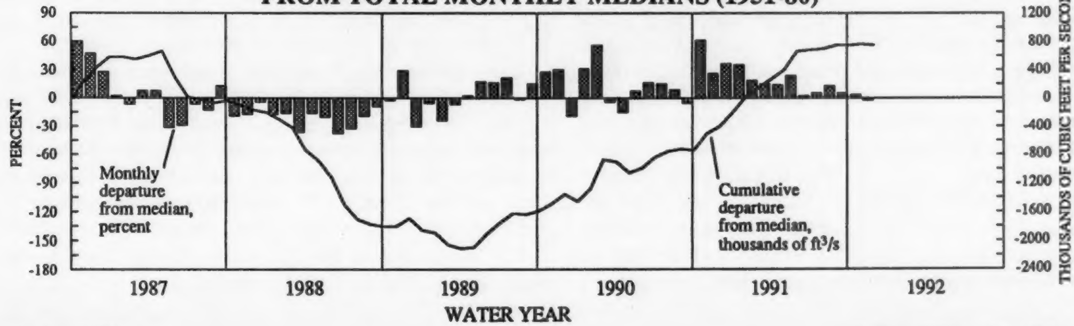
NOVEMBER 1991 STREAMFLOW RANGES



SUMMARY OF NOVEMBER 1991 STREAMFLOW FLOW RANGES



MONTHLY AND CUMULATIVE DEPARTURE OF TOTAL MONTHLY MEANS FROM TOTAL MONTHLY MEDIANS (1951-80)



NEW EXTREMES DURING NOVEMBER 1991 AT STREAMFLOW INDEX STATION

Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Previous November extremes (period of record) Monthly mean in cfs (year)	Previous November extremes (period of record) Daily mean in cfs (year)	November 1991 Monthly mean in cfs	November 1991 Percent of median	November 1991 Daily mean in cfs	November 1991 Day
			LOW FLOWS						
03020500	Oil Creek at Rouseville, Pennsylvania	300	59	72.9 (1953)	38 (1953)	62.3	14	42	6
06884400	Little Blue River near Barnes, Kansas	3,324	33	104 (1956)	70 (1955)	102	50	37	2
			HIGH FLOWS						
04121500	Muskegon River at Evart, Michigan	1,450	59	2,206 (1988)	3,530 (1985)	2,631	320	5,660	2
05365500	Chippewa River at Chippewa Falls, Wisconsin	5,650	103	12,610 (1938)	52,000 (1938)	16,440	426	46,500	3

Four new November extremes—lows in Pennsylvania and Kansas, highs in Michigan and Wisconsin—occurred at streamflow index stations, compared with one low during October. Hydrographs for the four stations at which new extremes occurred and three other stations (all with monthly means in either the below- or above-normal ranges) are on page 5.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 695,100 ft^3/s; 4 percent above median and in the normal range, after a 33 percent decrease in flow from October to November, when flow was in the below-normal range. Flow of the St. Lawrence River was in the normal range for the sixth consecutive month. Flow of the Mississippi River was in the normal range after a below-normal range October. Flow of the Columbia River was in the below-normal range for the third consecutive month. Hydrographs for both the combined and individual flows of the "Big 3" are on page 6. Dissolved solids and water temperatures at five large river stations are also given on page 6. Flow data for the "Big 3" and 42 other large rivers are given in the Flow of Large Rivers table on page 7.

Month-end index reservoir contents were in the below-average range (below the month-end average for the period of record by more than 5 percent of normal maximum contents) at 32 of 99 reporting sites, compared with 33 of 100 at the end of October, and 35 of 100 at the end of November 1990, including most reservoirs in New York, New Jersey, Maryland, Nebraska, North Dakota, Montana, Idaho, Wyoming, Nevada, and California. Contents were in the above-average range at 37 reservoirs (compared with 38 last month), including most reservoirs in Nova Scotia, Maine, New Hampshire, Vermont, South Carolina, Georgia, Alabama, the Tennessee Valley, Wisconsin, Minnesota, Oklahoma, Arizona, and New Mexico. Reservoirs with contents in the below-average range and significantly lower than last year (with normal maximum contents of at least 1,000,000 acre-feet) are: the New York City Reservoir System, New York; Allegheny, Pennsylvania; Toledo Bend, Texas; Hungry Horse, Montana; Boise River, Idaho; and Clair Engle Lake and Shasta Lake, California. Four reservoirs had less than 10 percent of normal maximum contents (November average in parentheses): John Martin, Colorado, 5 percent (16); Pine Flat, California 8 percent (38); Lake Tahoe, California-Nevada, 0 percent (45); and Rye Patch, Nevada, 1 percent (48). Graphs of contents for seven reservoirs are shown on page 8 with contents for the 99 reporting reservoirs given on page 9. Maps on page 11 show reservoir storage conditions for November 1991 and November 1990 on the streamflow maps for those months.

Mean November elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were above median on Lake Superior, below median on Lake Huron and Lake Erie, and in the below-normal range on Lake Ontario. Levels fell from those for October on all the lakes except Lake Superior. November levels ranged from 0.09 foot higher (Lake Superior) to 0.42 foot lower (Lake Erie) than those for October. Monthly means have now been in the normal range for 2 months on Lake Superior, 18 months on Lake Huron, and 8 months on Lake Erie . Monthly means have been in the below-normal range on Lake Ontario for the last three months. November 1991 levels ranged from 0.91 foot lower (Lake Ontario) to 0.27 foot higher (Lake Superior) than those for November 1990. Stage hydrographs for the master gages on Lake Superior, Lake Huron, Lake Erie, and Lake Ontario are on page 10.

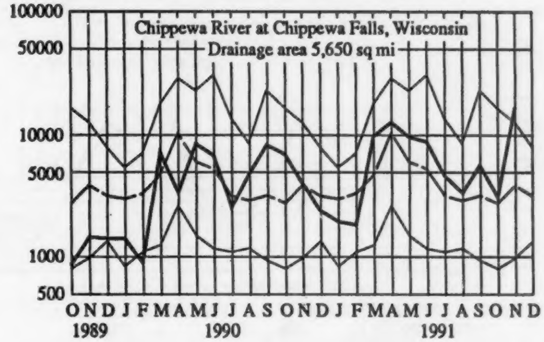
Utah's Great Salt Lake (graph on page 10) rose 0.20 foot November 1-30, ending the month at 4,201.60 feet above National Geodetic Vertical Datum. Lake level was 0.80 foot lower than at the end of November 1990, and 10.25 feet lower than the maximum of record which occurred in June 1986 and March-April 1987.

Maps on page 11 show streamflow conditions for November 1991 and November 1990. November 1991 has about 20 percent more area in the above-normal range, about 46 percent less area in the below-normal range, and about 13 percent more area in the normal range than November 1990. The distribution of area in the flow ranges is also dissimilar for the two months. Below-normal range streamflow occurred during both months in parts of California, Nevada, Oregon, Utah, Montana, North Dakota, Minnesota, Nebraska, Kansas, and Florida. Above-normal range streamflow occurred during both months in parts of Nova Scotia, Michigan, Wisconsin, Illinois, Texas, Colorado, and New Mexico. Both maps also show reservoir storage at all index reservoir stations for comparison with streamflow.

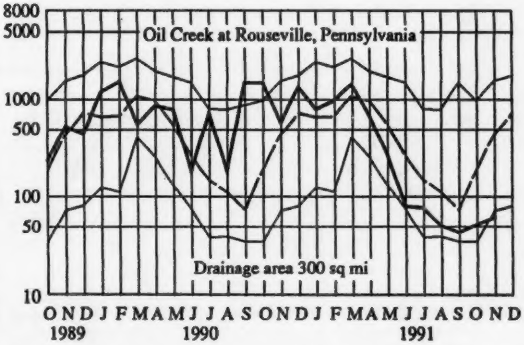
Graphs for 12 hydrologic areas show monthly percent departure of streamflow from median for the 1987-92 water years to date (page 12) and also compare monthly streamflow for the 1991 and 1992 water years with median monthly streamflow for 1951-80 (page 13). Streamflow was below median in the Atlantic Slope, Ohio River, the Great and other closed, Pacific Slope, and Columbia River basins, and above median in the other basins. Streamflow decreased from that for October only in the St. Lawrence River and Pacific Slope basins, and increased in the other basins.

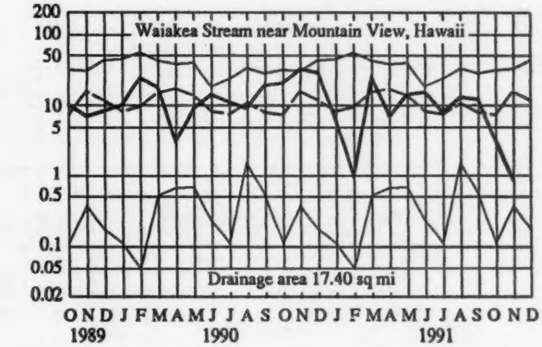
MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

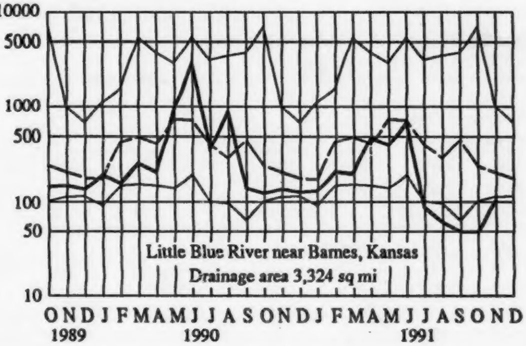
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.

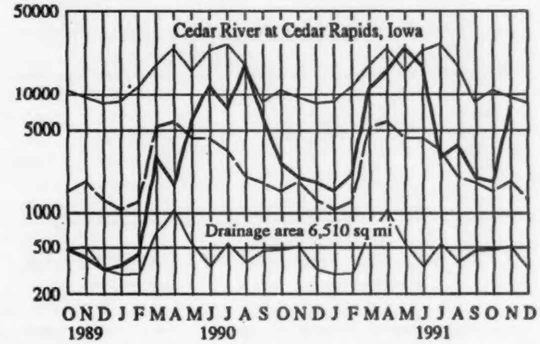


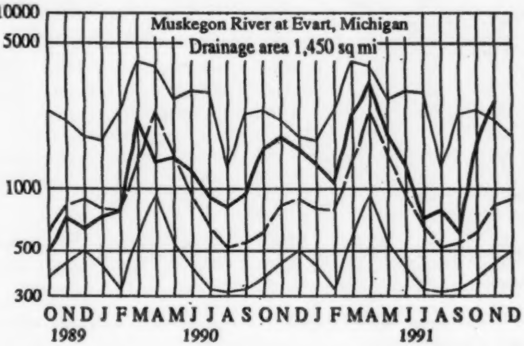
DISCHARGE IN CUBIC FEET PER SECOND

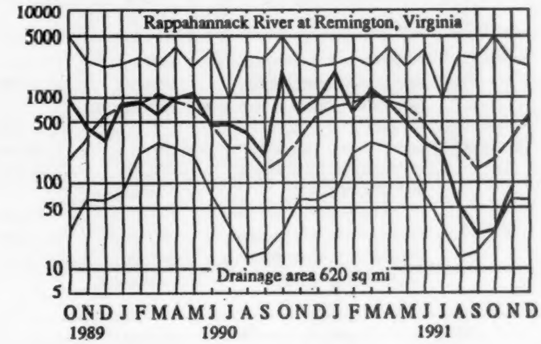






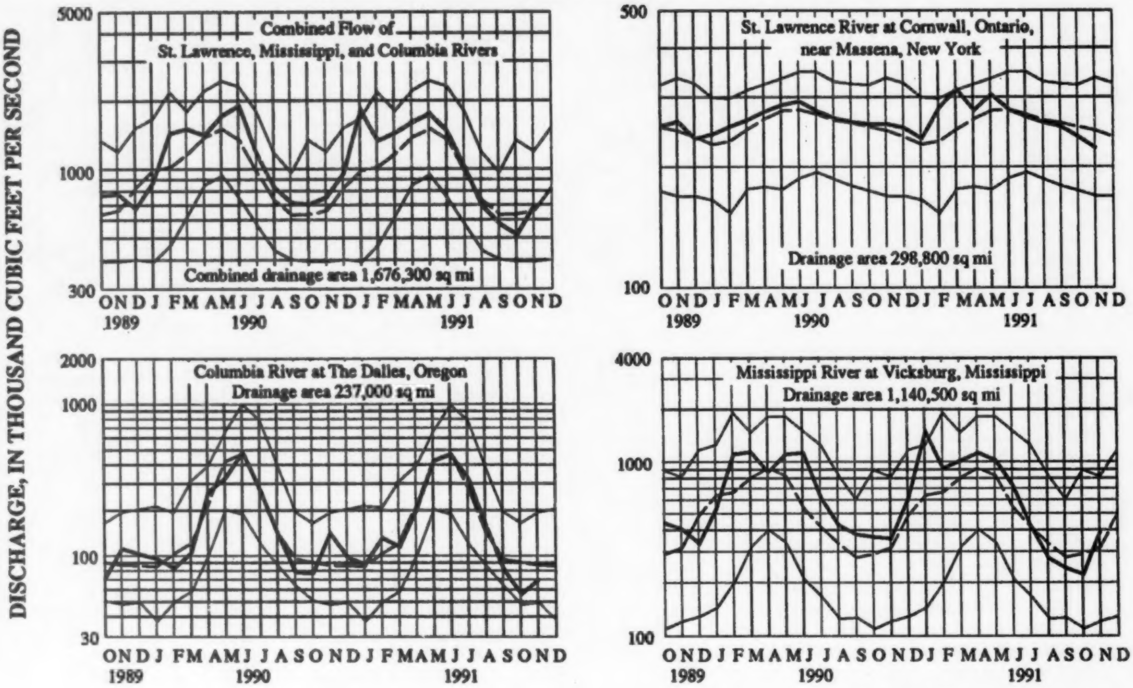






HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.



Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, FOR NOVEMBER 1991, AT DOWNSTREAM SITES ON FIVE LARGE RIVERS

Station number	Station name	November data of following calendar years	Stream discharge during month Mean (cfs)	Dissolved-solids concentration[1] Minimum (mg/L)	Dissolved-solids concentration[1] Maximum (mg/L)	Dissolved-solids discharge[1] Mean (tons per day)	Dissolved-solids discharge[1] Minimum (tons per day)	Dissolved-solids discharge[1] Maximum (tons per day)	Water temperature[2] Mean in °C	Water temperature[2] Minimum in °C	Water temperature[2] Maximum in °C
01463500	Delaware River at Trenton,	1991	6,027	75	147	1,694	879	7,357	9.0	5.5	13.0
	New Jersey, (Morrisville,	1944-90	10,220	55	151	[3]2,867	469	12,300	[3]8.5	2.0	19.0
	Pennsylvania)	(Extreme yr)		(1955)	(1964)		(1963)	(1972)			
			[4]9,825								
07289000	Mississippi River at	1991	400,100	213	327	273,100	248,000	313,100	10.5	8.0	17.5
	Vicksburg, Mississippi	1975-90	451,200	181	330	294,000	123,000	677,800	13.5	8.0	20.0
		(Extreme yr)		(1984)	(1988)		(1976)	(1985)			
			[4]320,600								
03612500	Ohio River at lock and dam 53,	1991	119,300	187	286	...	48,100	163,000	...	12.5	19.0
	near Grand Chain, Illinois,	1954-90	185,900	129	425	...	13,900	406,000	...	1.0	19.5
	(streamflow station at Metropolis,	(Extreme yr)		(1957)	(1968)		(1986)	(1957)			
	Illinois)		[4]147,600								
06934500	Missouri River at Hermann,	1991	35,300	386	504	41,400	30,700	60,300	9.5	4.0	15.0
	Missouri. (60 miles west of	1975-90	80,400	204	516	84,850	29,900	246,000	9.5	3.5	16.0
	St. Louis, Missouri)	(Extreme yr)		(1985)	(1987)		(1990)	(1985)			
			[4]54,680								
14128910	Columbia River at Warrendale,	1991	137,000	86	94	33,700	27,300	41,600	10.5	9.0	13.0
	Oregon (streamflow station at	1975-90	133,000	38	128	36,800	10,800	66,400	11.5	3.0	15.0
	The Dalles, Oregon)	(Extreme yr)		(1980)	(1978)		(1980)	(1978)			
			[4]87,960								

[1]Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[2]To convert °C to °F: [(1.8 x °C) + 32] = °F.
[3]Mean for 7-year period (1983-90).
[4]Median of monthly values for 30-year reference period, water years 1951-80, for comparison with data for current month.

Provisional data; subject to revision

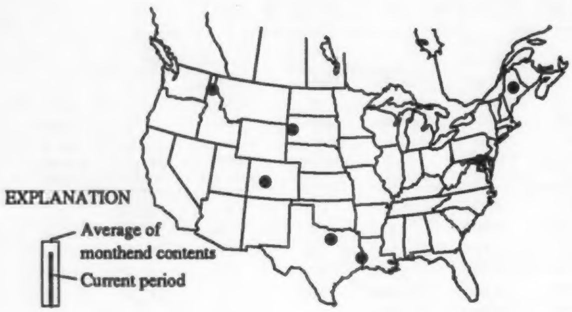
FLOW OF LARGE RIVERS DURING NOVEMBER 1991

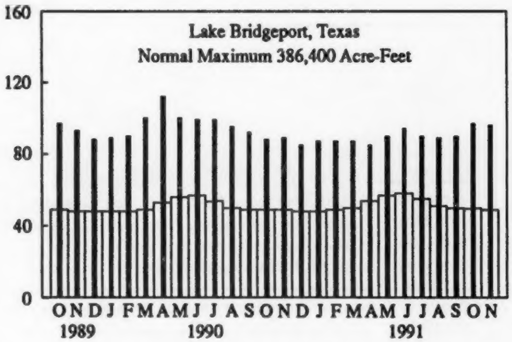
Station number	Stream and place of determination	Drainage area (square miles)	Average discharge through September 1985 (cubic feet per second)	November 1991: Monthly mean discharge (cubic feet per second)	November 1991: Percent of median monthly discharge 1951–80	November 1991: Change in discharge from previous month (percent)	November 1991: Discharge near end of month: Cubic feet per second	November 1991: Discharge near end of month: Million gallons per day	November 1991: Discharge near end of month: Date
01014000	St. John River below Fish River at Fort Kent, Maine	5,665	9,758	8,889	126	–30	8,510	5,500	30
01318500	Hudson River at Hadley, New York	1,664	2,908	1,890	79	5	2,320	1,500	30
01357500	Mohawk River at Cohoes, New York	3,456	5,683	4,190	84	119	5,850	3,780	30
01463500	Delaware River at Trenton, New Jersey	6,780	11,670	6,027	61	62	8,300	5,360	30
01570500	Susquehanna River at Harrisburg, Pennsylvania	24,100	34,340	† 9,810	40	80	18,200	11,800	30
01646500	Potomac River near Washington, District of Columbia	11,560	[1]11,500	† [1]1,990	45	13	...	...	...
02105500	Cape Fear River at William O. Huske Lock, near Tarheel, North Carolina.	4,852	5,002	1,553	80	20	...	...	...
02131000	Pee Dee River at Peedee, South Carolina	8,830	9,871	3,933	87	7	1,510	975	30
02226000	Altamaha River at Doctortown, Georgia	13,600	13,730	† 3,306	66	0	3,640	2,350	30
02320500	Suwannee River at Branford, Florida	7,880	6,986	4,206	126	–30	...	...	...
02358000	Apalachicola River at Chattahoochee, Florida	17,200	22,420	10,690	96	–23	...	...	...
02467000	Tombigbee River at Demopolis lock and dam, near Coatopa, Alabama.	15,385	23,520	6,394	101	132	5,750	3,720	30
02489500	Pearl River near Bogalusa, Louisiana	6,573	9,880	4,549	177	28	5,300	3,430	30
03049500	Allegheny River at Natrona, Pennsylvania	11,410	[1]19,580	† [1]3,330	24	9	4,210	2,720	27
03085000	Monongahela River at Braddock, Pennsylvania	7,337	[1]12,480	† [1]4,220	55	110	7,390	4,780	27
03193000	Kanawha River at Kanawha Falls, West Virginia	8,367	12,550	4,735	60	83	4,220	2,730	30
03234500	Scioto River at Higby, Ohio	5,131	4,583	† 716	44	4	733	473	30
03294500	Ohio River at Louisville, Kentucky[2] #	91,170	115,800	39,830	64	75	69,100	44,700	26
03377500	Wabash River at Mount Carmel, Illinois	28,635	27,660	12,910	117	152	15,900	10,300	30
03469000	French Broad River below Douglas Dam, Tennessee[3] #	4,543	[1]6,739	[1]3,264	70	70	...	...	...
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wisconsin.[2]	6,010	4,238	* 6,989	200	151	6,560	4,240	30
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, New York.[4] #	298,800	243,900	224,000	90	–6	221,000	143,000	30
02NG001	St. Maurice River at Grand Mere, Quebec	16,300	24,910	18,600	103	–28	19,500	12,600	29
05082500	Red River of the North at Grand Forks, North Dakota	30,100	2,593	† 471	37	–29	615	397	30
05133500	Rainy River at Manitou Rapids, Minnesota	19,400	12,920	11,000	113	77	21,000	13,600	25
05330000	Minnesota River near Jordan, Minnesota	16,200	3,680	* 5,240	583	56	5,900	3,810	30
05331000	Mississippi River at St. Paul, Minnesota#	36,800	[1]11,020	* 13,860	221	28	16,400	10,600	30
05365500	Chippewa River at Chippewa Falls, Wisconsin	5,650	5,149	* 16,440	426	434	9,500	6,140	30
05407000	Wisconsin River at Muscoda, Wisconsin	10,400	8,710	* 11,000	168	96	10,300	6,660	30
05446500	Rock River near Joslin, Illinois	9,549	6,080	* 7,250	191	116	8,680	5,610	30
05474500	Mississippi River at Keokuk, Iowa#	119,000	63,790	* 90,540	197	100	127,000	82,100	30
06214500	Yellowstone River at Billings, Montana	11,795	7,056	3,930	102	–2	3,350	2,160	30
06934500	Missouri River at Hermann, Missouri#	524,200	80,880	† 35,280	65	–15	30,700	19,800	30
07289000	Mississippi River at Vicksburg, Mississippi[5] #	1,140,500	584,000	400,100	125	77	488,000	315,000	29
07331000	Washita River near Dickson, Oklahoma	7,202	1,402	* 3,585	910	102	3,500	2,260	23
08276500	Rio Grande below Taos Junction Bridge, near Taos, New Mexico.	9,730	742	492	117	53	301	194	30
09315000	Green River at Green River, Utah	44,850	6,391	2,726	98	15	...	...	...
11425500	Sacramento River at Verona, California	21,251	19,430	† 6,581	50	–17	...	...	...
13269000	Snake River at Weiser, Idaho	69,200	18,520	† 11,500	76	6	11,300	7,300	30
13317000	Salmon River at White Bird, Idaho	13,550	11,390	† 4,470	87	28	4,210	2,720	30
13342500	Clearwater River at Spalding, Idaho	9,570	15,510	4,670	92	123	3,720	2,400	30
14105700	Columbia River at The Dalles, Oregon[6] #	237,000	[1]193,500	† [1]70,980	81	25	116,000	74,600	30
14191000	Willamette River at Salem, Oregon	7,280	[1]23,690	[1]28,260	106	776	60,400	39,000	30
15515500	Tanana River at Nenana, Alaska	25,600	23,810	* 9,738	117	–45	8,550	5,520	30
08MF005	Fraser River at Hope, British Columbia	83,800	96,250	† 44,140	75	–20	45,600	29,400	29

#Indicates stations excluded from the combination bar/line graph. See Explanation of Data.
[1]Adjusted.
[2]Records furnished by Corps of Engineers.
[3]Records furnished by Tennessee Valley Authority.
[4]Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.
[5]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[6]Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

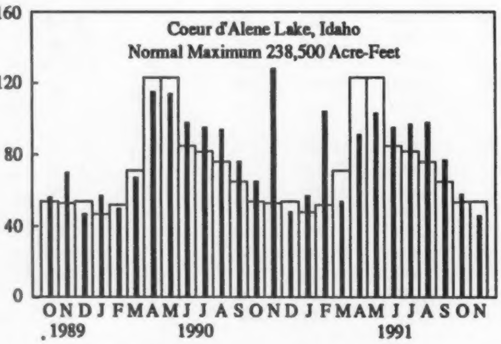
* Above-normal range
† Below-normal range

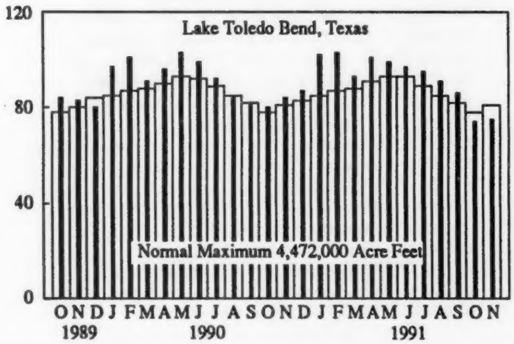
USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS

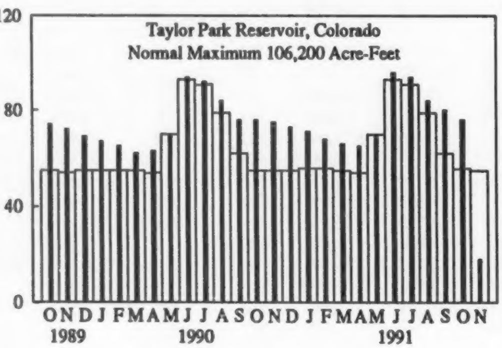


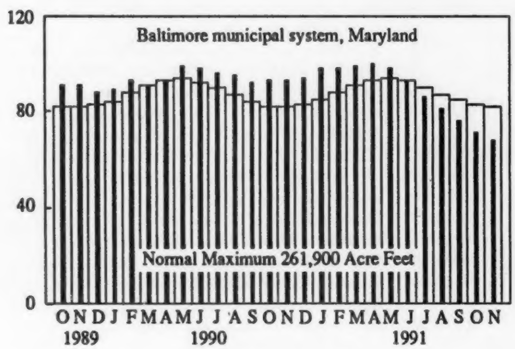


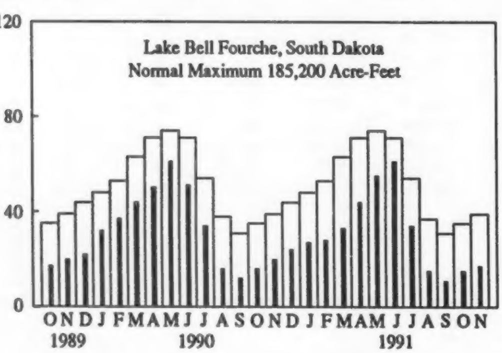
PERCENT OF NORMAL MAXIMUM

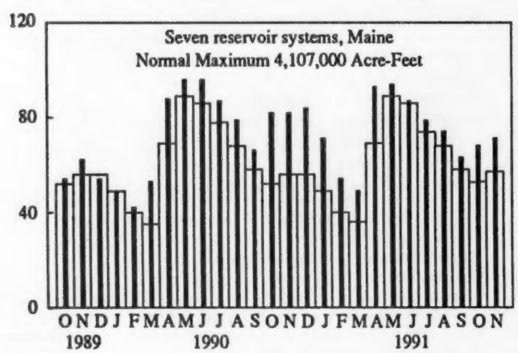












Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS NEAR END OF NOVEMBER 1991

[Contents are expressed in percent of reservoir or reservoir system capacity. The usable capacity of reservoir or reservoir system is shown in the column headed "Normal maximum"]

Reservoir or reservoir system Principal uses: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial	Percent of normal maximum				
	End of November 1991	End of November 1990	Average for end of November	End of October 1991	Normal maximum (acre-feet)[1]
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	* 56	42	40	58	[2]226,300
QUEBEC					
Allard (P)	* 91	32	62	86	280,600
Gouin (P)	68	81	69	66	6,954,000
MAINE					
Seven Reservoir Systems (MP)	* 71	82	57	68	4,107,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	74	78	73	77	76,450
Lake Francis (FPR)	* 88	67	78	90	99,310
Lake Winnipesaukee (PR)	* 78	83	60	76	165,700
VERMONT					
Harriman (P)	* 74	68	65	71	116,200
Somerset (P)	* 83	77	71	78	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	75	85	72	72	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	† 51	76	57	52	786,700
Indian Lake (FMP)	59	81	60	67	103,300
New York City Reservoir System (MW)	† 51	85	71	48	1,680,000
NEW JERSEY					
Wanaque (M)	† 49	74	66	46	85,100
PENNSYLVANIA					
Allegheny (FPR)	† 15	36	34	20	1,180,000
Pymatuning (FMR)	† 70	88	81	73	188,000
Raystown Lake (FR)	62	67	57	63	761,900
Lake Wallenpaupack (PR)	49	74	53	43	157,800
MARYLAND					
Baltimore Municipal System (M)	† 68	93	82	71	261,900
NORTH CAROLINA					
Bridgewater (Lake James) (P)	* 90	91	79	91	288,800
Narrows (Badin Lake) (P)	91	95	91	95	128,900
High Rock Lake (P)	57	55	55	70	234,800
SOUTH CAROLINA					
Lake Murray (P)	* 73	61	62	78	1,614,000
Lakes Marion and Moultrie (P)	* 75	76	65	77	1,777,000
SOUTH CAROLINA-GEORGIA					
Strom Thurmond Lake (FP)	* 62	58	51	71	1,730,000
GEORGIA					
Burton (PR)	* 70	95	61	80	104,000
Sinclair (MPR)	* 89	87	75	89	214,000
Lake Sidney Lanier (FMPR)	47	41	49	48	1,686,000
ALABAMA					
Lake Martin (P)	* 81	87	62	86	1,375,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	* 39	38	31	41	2,293,000
Douglas Lake (FPR)	21	21	18	29	1,395,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	* 55	51	43	63	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	* 48	46	36	51	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	* 57	24	41	66	1,478,000
WISCONSIN					
Chippewa and Flambeau (PR)	* 98	88	76	85	365,000
Wisconsin River (21 Reservoirs) (PR)	* 88	85	66	60	399,000
MINNESOTA					
Mississippi River Headwater System (FMR)	* 34	27	27	33	1,640,000
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	† 65	60	83	67	22,700,000
SOUTH DAKOTA					
Angostura (I)	71	41	68	70	130,770
Belle Fourche (I)	† 17	20	39	15	185,200
Lake Francis Case (FIP)	51	54	52	52	4,589,000
Lake Oahe (FIP)	60	55	65	58	22,240,000
Lake Sharpe (FIP)	101	100	97	98	1,697,000
Lewis and Clark Lake (FIP)	96	97	101	100	432,000
NEBRASKA					
Lake McConaughy (IP)	† 50	51	68	47	1,948,000
OKLAHOMA					
Eufaula (FPR)	* 102	96	91	108	2,378,000
Keystone (FPR)	† 89	80	95	78	661,000
Tenkiller Ferry (FPR)	* 111	102	100	107	628,200
Lake Altus (FIMR)	* 55	60	47	50	133,000
Lake O'The Cherokees (FPR)	87	89	83	88	1,492,000
OKLAHOMA-TEXAS					
Lake Texoma (FMPRW)	* 102	96	92	101	2,722,000
TEXAS					
Bridgeport (IMW)	* 96	89	49	97	386,400
Canyon (FMR)	84	95	79	85	385,600
International Amistad (FIMPW)	* 102	96	86	104	3,497,000
International Falcon (FIMPW)	* 103	77	75	98	2,668,000
Livingston (IMW)	* 105	101	88	99	1,788,000
Possum Kingdom (IMPRW)	94	93	96	93	570,200
Red Bluff (P)	28	21	29	25	307,000
Toledo Bend (P)	† 75	84	81	74	4,472,000
Twin Buttes (FIM)	38	48	34	37	177,800
Lake Kemp (IMW)	* 100	92	86	100	268,000
Lake Meredith (FMW)	38	33	37	38	796,900
Lake Travis (FIMPRW)	* 90	92	78	86	1,144,000
MONTANA					
Canyon Ferry (FIMPR)	† 78	83	87	75	2,043,000
Fort Peck (FPR)	† 63	57	83	63	18,910,000
Hungry Horse (FIPR)	† 70	83	82	75	3,451,000
WASHINGTON					
Ross (PR)	82	92	79	84	1,052,000
Franklin D. Roosevelt Lake (IP)	98	101	99	98	5,022,000
Lake Chelan (PR)	62	97	65	74	676,100
Lake Cushman (PR)	77	52	80	76	359,500
Lake Merwin (P)	* 99	98	91	103	245,600
IDAHO					
Boise River (4 Reservoirs) (FIP)	† 20	34	51	16	1,235,000
Coeur d'Alene Lake (P)	† 46	128	54	58	238,500
Pend Oreille Lake (FP)	† 34	37	46	49	1,561,000
IDAHO-WYOMING					
Upper Snake River (8 Reservoirs) (MP)	† 38	36	54	39	4,401,000
WYOMING					
Boysen (FIP)	83	75	79	84	802,000
Buffalo Bill (IP)	† 60	39	69	59	421,300
Keyhole (F)	† 15	15	40	15	193,800
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	† 34	32	48	33	3,056,000
COLORADO					
John Martin (FIR)	† 5	7	16	2	364,400
Taylor Park (IR)	† 18	75	55	76	106,200
Colorado-Big Thompson Project (I)	54	48	57	55	730,300
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	† 64	67	76	64	31,620,000
UTAH-IDAHO					
Bear Lake (IPR)	...	33	59	30	1,421,000
CALIFORNIA					
Folsom (FIMPR)	† 40	17	49	42	1,000,000
Hetch Hetchy (MP)	* 52	27	42	58	360,400
Isabella (FIR)	† 16	8	24	16	568,100
Pine Flat (FIR)	† 8	3	38	5	1,001,000
Clair Engle Lake (Lewiston) (FP)	† 22	39	67	23	2,438,000
Lake Almanor (P)	* 65	67	51	65	1,036,000
Lake Berryessa (FIMRW)	† 34	37	72	34	1,600,000
Millerton Lake (FI)	35	31	39	33	503,200
Shasta Lake (FIPR)	† 30	38	63	31	4,377,000
CALIFORNIA-NEVADA					
Lake Tahoe (IMPRW)	† 0	0	45	0	744,600
NEVADA					
Rye Patch (I)	† 1	0	48	1	194,300
ARIZONA-NEVADA					
Lake Mead and Lake Mohave (FIMP)	74	76	72	74	27,970,000
ARIZONA					
San Carlos (IP)	* 38	5	21	37	935,100
Salt and Verde River System (IMPR)	* 73	39	40	74	2,019,100
NEW MEXICO					
Conchas (FIR)	* 88	58	82	85	315,700
Elephant Butte and Caballo (FIPR)	* 72	59	40	70	2,394,000

[1] 1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day.

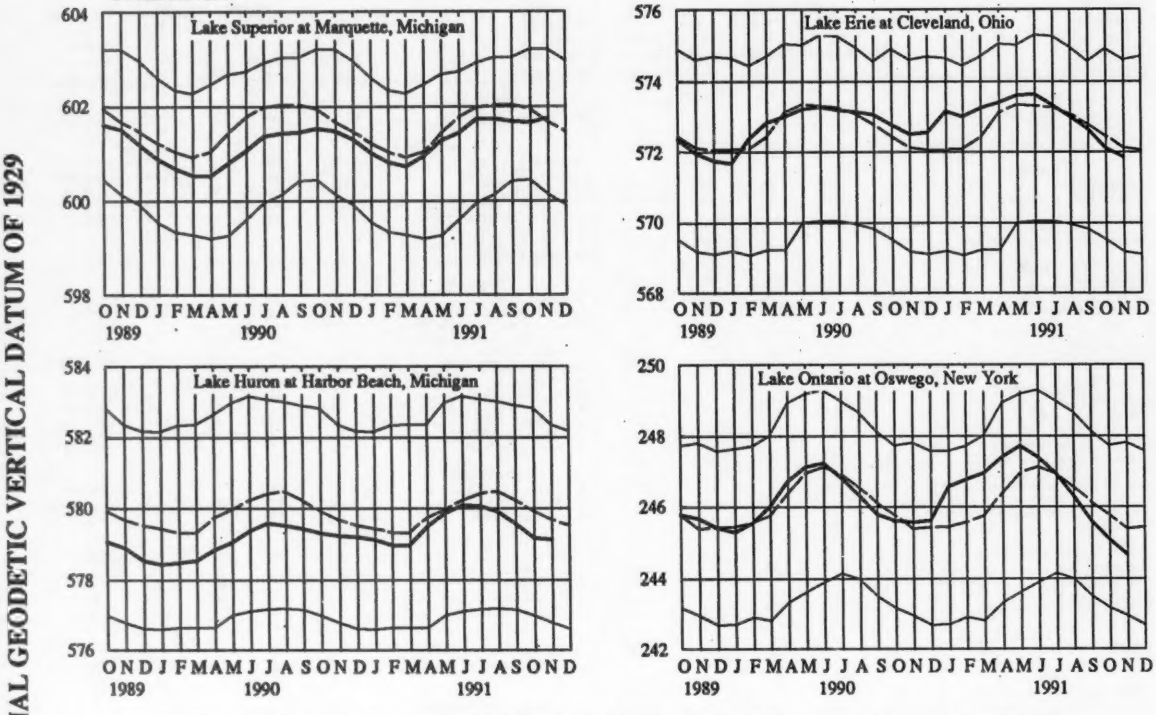
[2] Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

* Above-average range

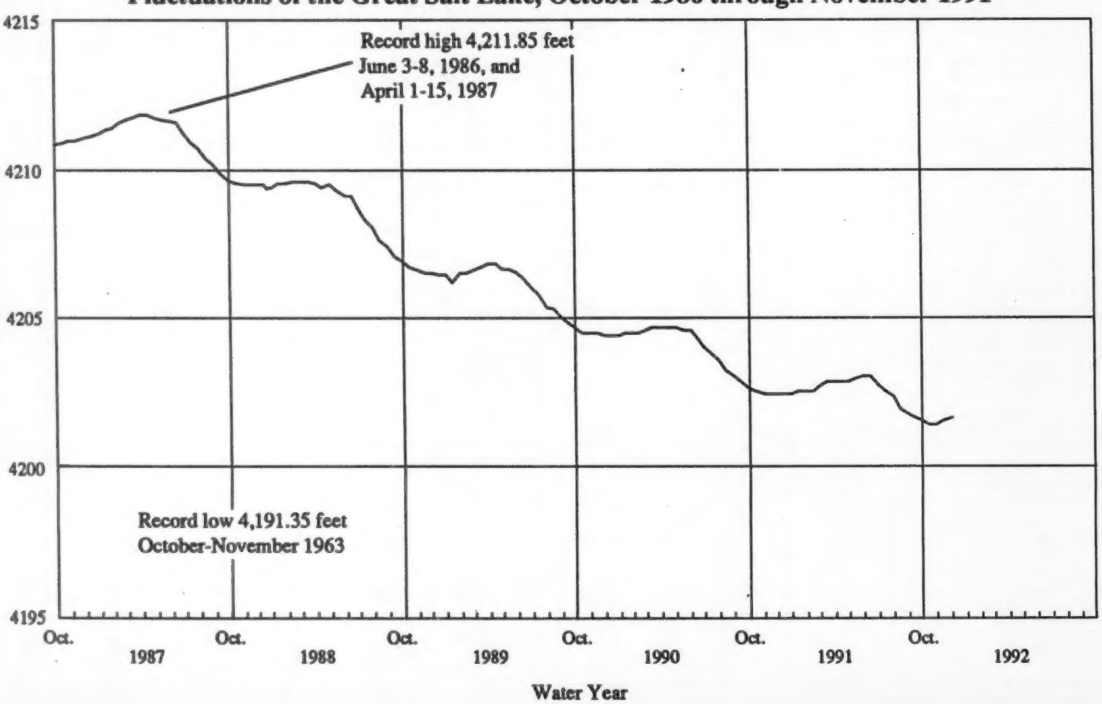
† Below-average range

GREAT LAKES ELEVATIONS

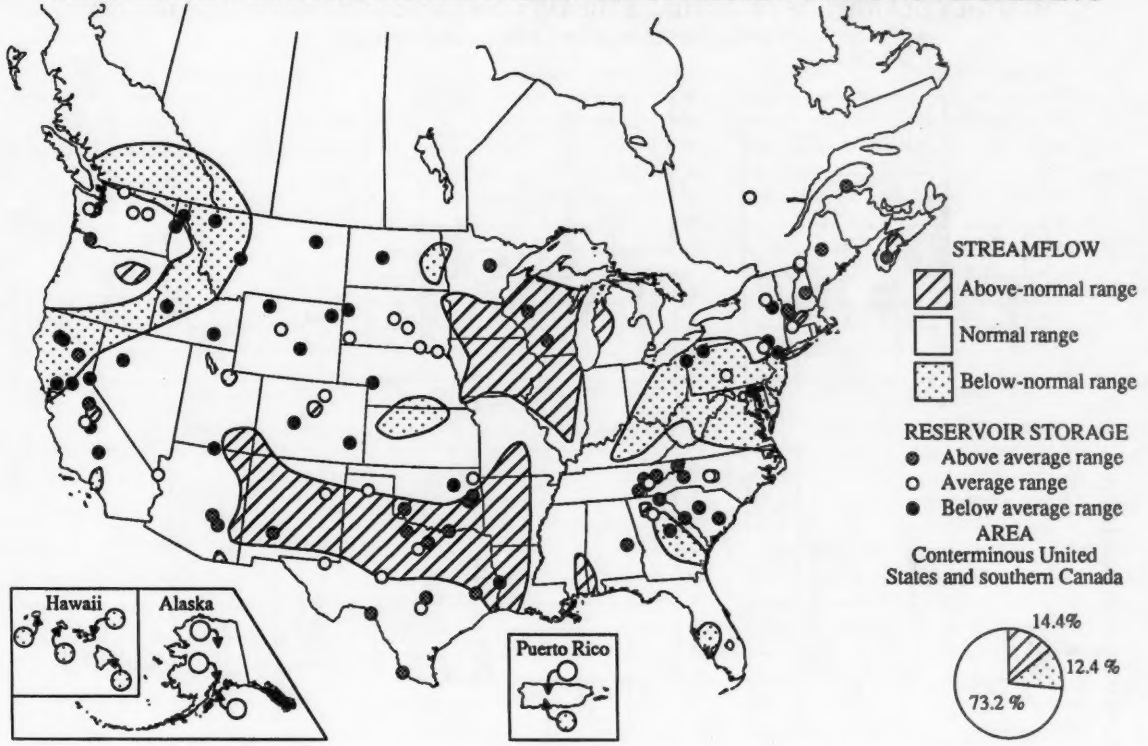
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period. Data from National Ocean Service.



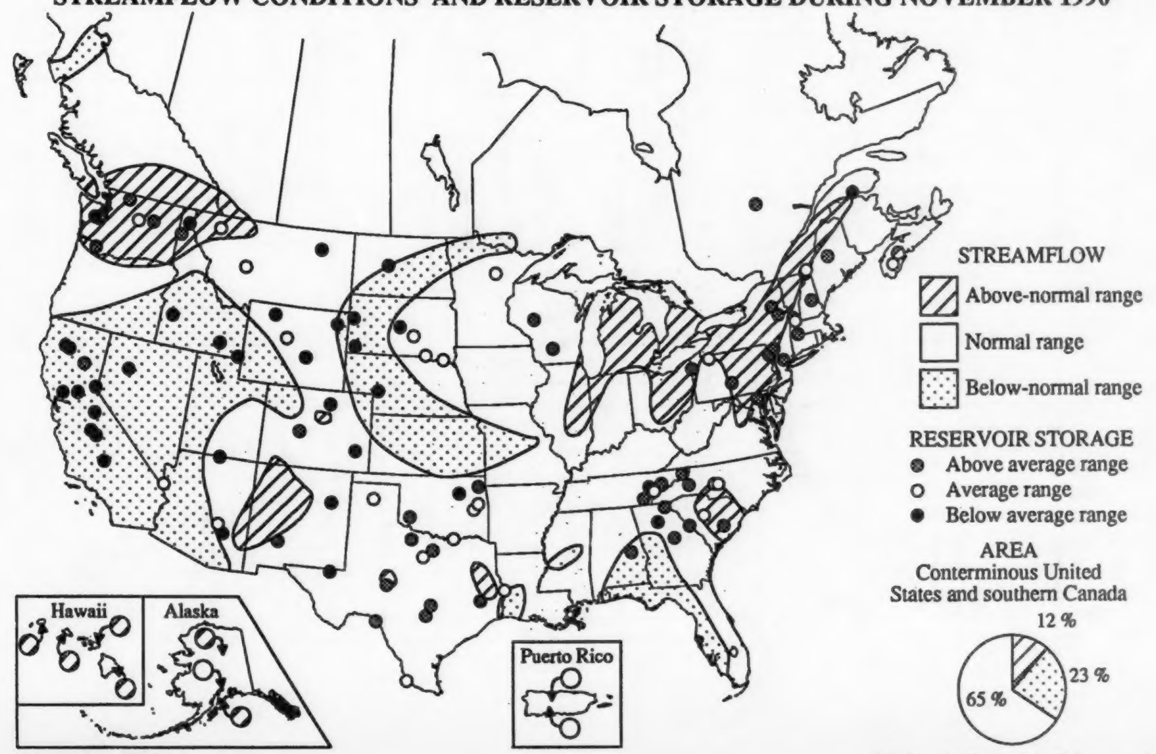
Fluctuations of the Great Salt Lake, October 1986 through November 1991



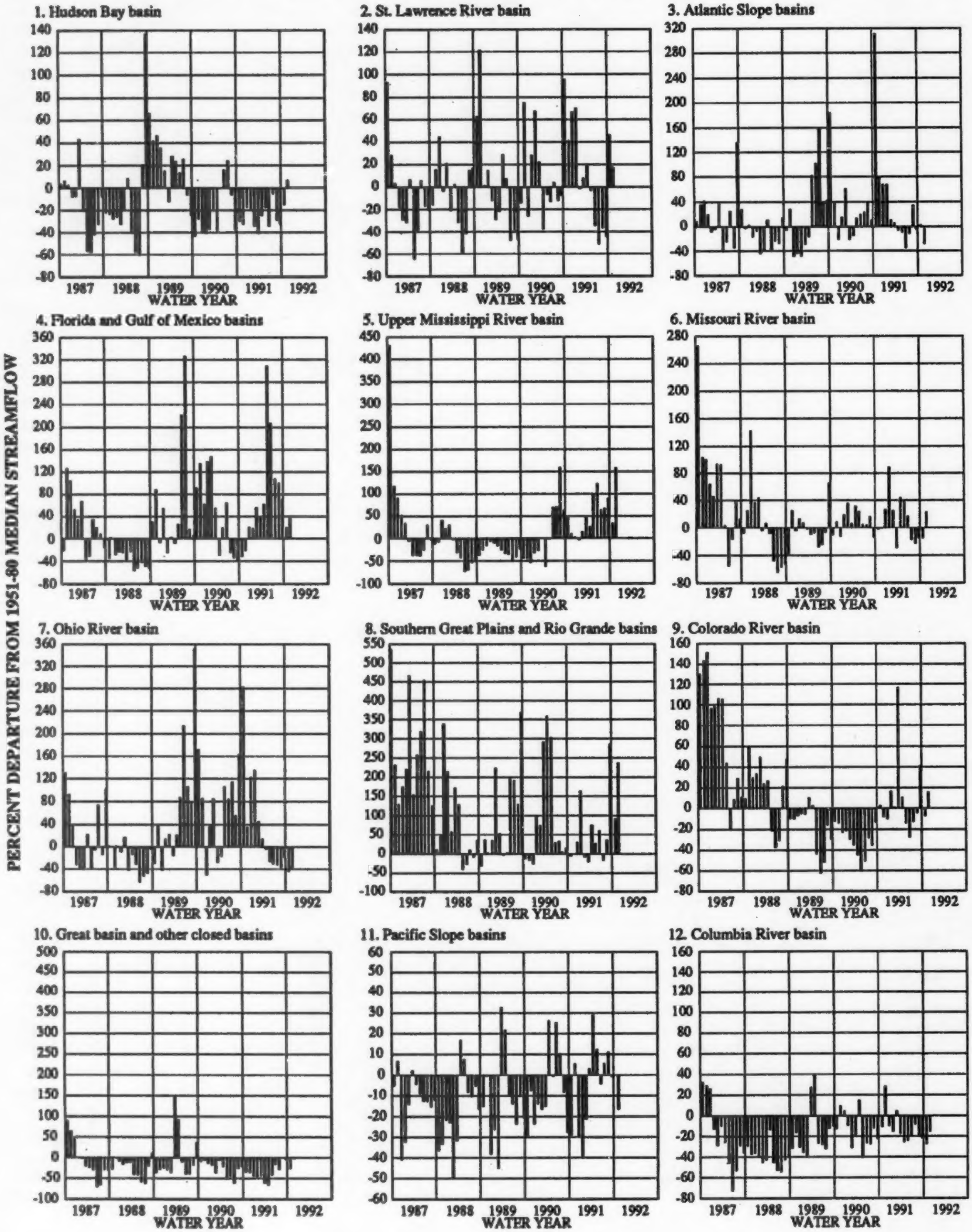
STREAMFLOW CONDITIONS AND RESERVOIR STORAGE DURING NOVEMBER 1991



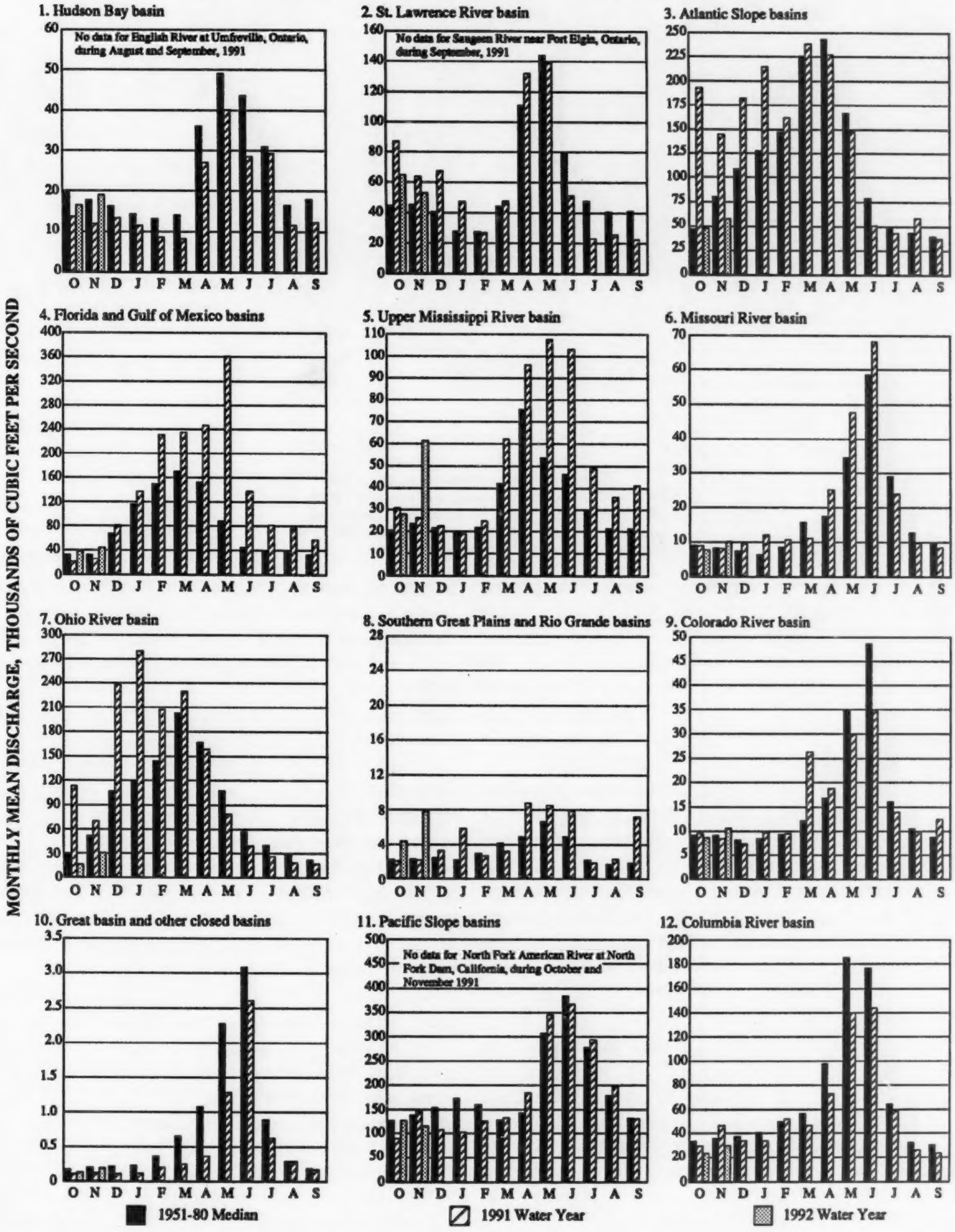
STREAMFLOW CONDITIONS AND RESERVOIR STORAGE DURING NOVEMBER 1990



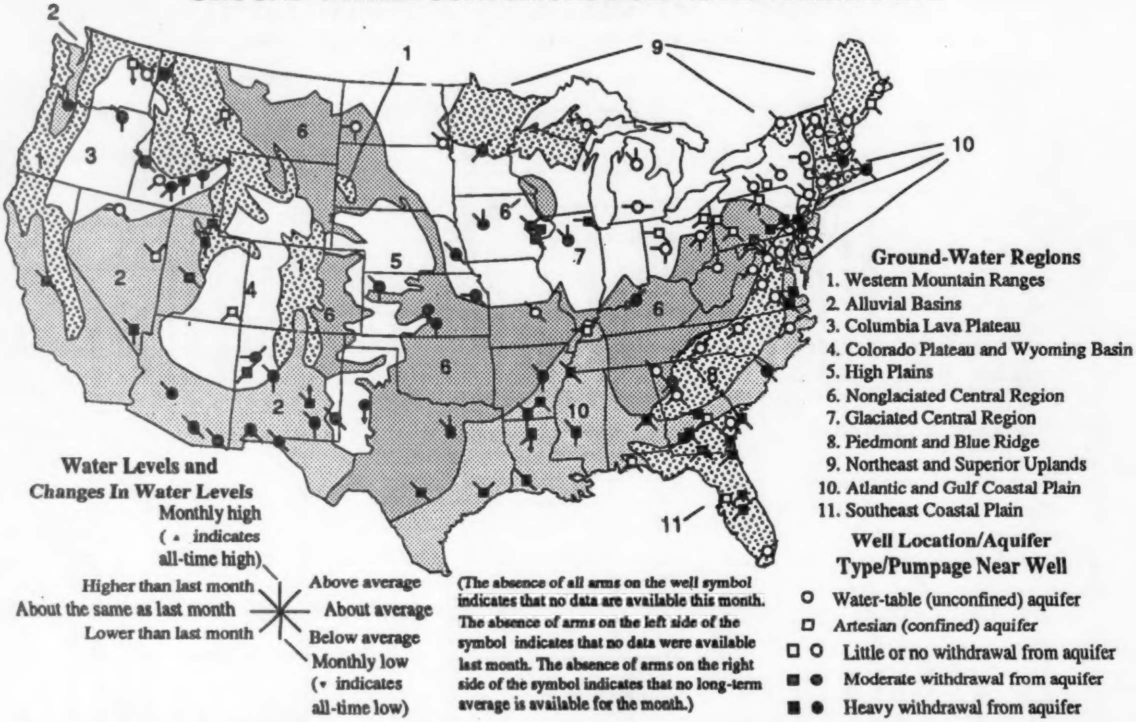
MONTHLY DEPARTURE OF ACTUAL STREAMFLOW (OCTOBER 1987-NOVEMBER 1991) FROM MEDIAN STREAMFLOW (1951-80)



ACTUAL MONTHLY STREAMFLOW, 1991 AND 1992 WATER YEARS, COMPARED WITH MEDIAN MONTHLY STREAMFLOW, 1951-80



GROUND-WATER CONDITIONS DURING NOVEMBER 1991



New extremes occurred at 34 ground-water index stations (see table on page 16) during November-27 lows (including 5 all-time) and 7 highs (including 1 all-time)—compared with 28 new extremes last month. Graphs showing water levels at seven stations for the past 26 months are on page 17. The graphs on page 17 are for wells in the Alluvial Basins region in Nevada, the Columbia Lava Plateau region in Idaho, the Nonglaciated Central region in Kansas, the Northeast and Superior Uplands region in Minnesota, the Atlantic and Gulf Coastal Plain region in Kentucky, the Southeast Coastal Plain region in Florida, and the Piedmont and Blue Ridge region in Maryland.

Ground-water levels in the Western Mountain Ranges region were above last month's level in Washington and below last month's levels in Idaho and Montana. Levels were above long-term averages in Washington and Idaho and below average in Montana. Level fell to a November low in the Montana well.

In the Alluvial Basins region, ground-water levels were generally at or above last month's levels throughout the region. Levels were above long-term average in Oregon, and generally below long-term averages elsewhere in the region. November lows occurred in wells in California, Nevada, Utah, and New Mexico. Levels rose to a November high in the well in Oregon and an all-time high in the Roswell Basin Artisian aquifer at Roswell, New Mexico.

In the Columbia Lava Plateau region, levels were above last month's in Oregon and mixed with respect to last month's levels in Idaho. Levels were below long-term averages throughout the region. Two new November low levels occurred and one level tied the previous low in wells in Idaho. A November low also occurred in the Oregon well. An all-time low occurred in the sand aquifer interbedded in the Grand Ronde Basalt near Mansfield, Washington.

Ground-water levels in the Colorado Plateau and Wyoming Basin region were at or below last month's levels throughout the region. Levels were below long-term average in Utah and above average in New Mexico.

In the High Plains region, ground-water levels were above last month's levels and below long-term averages throughout the region. A November low occurred in the well in Kansas and an all-time low occurred in the Ogallala aquifer near Lubbock, Texas.

Water levels in the Nonglaciated Central region were above last month's levels in Texas, Missouri, and Georgia, mixed in Kansas, and generally at or below last month's levels elsewhere in the region. Levels were above long-term averages in Kentucky and West Virginia, mixed in Texas, and at or below average elsewhere. November lows occurred in wells in North Dakota, Kansas, and Pennsylvania. Monthly highs occurred in wells in Texas and West Virginia.

Ground-water levels in the Glaciated Central region were at or below last month's levels in Kansas, Ohio, and Pennsylvania and generally above last month's levels elsewhere.

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WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES–NOVEMBER 1991

GROUND–WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well in feet	Water level in feet below land–surface datum	Departure from average in feet	Net change in water level in feet since: Last month	Last year	Year records began	Remarks
WESTERN MOUNTAIN RANGES (1)								
Rathdrum Prairie aquifer near Athol, northern Idaho	●	485	458.9	1.9	–0.9	0.8	1929	
ALLUVIAL BASINS (2)								
Alluvial valley fill aquifer in Steptoe Valley, Nevada	□	122	8.61	3.79	.45	–.23	1949	
Valley fill aquifer, Elfrida area near Douglas, Arizona	●	124	102.68	–19.42	.28	–2.99	1947	
Hueco bolson aquifer at El Paso, Texas	●	640	272.45	–21.14	.11	–.60	1964	
COLUMBIA LAVA PLATEAU (3)								
Snake River Plain aquifer near Eden, Idaho	●	208	126.3	–9.6	–2.7	–4.6	1962	Nov. low
Columbia River basalt aquifer, Pendleton, Oregon		1,501	220.28	–31.61	2.41	–1.88	1965	Nov. low
COLORADO PLATEAU AND WYOMING BASIN (4)								
Dakota aquifer near Blanding, Utah	□	140	49.63	–3.68	–.36	–3.29	1960	
HIGH PLAINS (5)								
Ogallala aquifer near Colby, Kansas	●	175	131.03	–11.17	.18	–1.09	1947	Nov. low
Southern High Plains aquifer, Lovington, New Mexico	●	212	59.46	–3.99	.18	.43	1971	
NONGLACIATED CENTRAL REGION (6)								
Sentinel Butte aquifer near Dickinson, North Dakota	○	160	21.67	–3.30	.02	–.67	1968	Nov. low
Sand and gravel Pleistocene aquifer near Valley Center, Kansas	●	54	21.03	–3.68	.23	–.96	1937	Nov. low
Glacial outwash sand and gravel aquifer near Louisville, Kentucky	●	94	17.53	7.11	–.20	.54	1945	
Upper Pennsylvanian aquifer in the Central Appalachians Plateau near Glenville, West Virginia	○	25	13.04	4.09	.04	2.53	1953	Nov. high
GLACIATED CENTRAL REGION (7)								
Fluvial sand and gravel aquifer, Platte River Valley, near Ashland, Nebraska	●	12	8.62	–2.35	.13	–.96	1933	
Sheyenne Delta aquifer near Wyndmere, North Dakota	○	40	8.17	–2.30	.10	.51	1963	
Pleistocene (glacial drift) aquifer at Princeton in northern Illinois	●	29	5.85	6.70	1.00	.75	1942	Nov. high
Shallow drift aquifer near Roscommon in north–central part of Lower Peninsula, Michigan	○	14	3.56	1.30	.30	1.05	1934	Nov. high
Silurian–Devonian carbonate aquifer near Dola, Ohio	□	51	12.33	–2.68	–.08	–5.49	1954	
PIEDMONT AND BLUE RIDGE (8)								
Water–table aquifer in Petersburg Granite, southeastern Piedmont, Colonial Heights, Virginia	○	100	17.61	–1.29	–.48	–1.37	1939	
Weathered granite aquifer, western Piedmont, Mocksville area, North Carolina	○	31	16.96	1.83	–.15	–.93	1981	
Surficial aquifer at Griffin, Georgia	○	30	19.17	–1.17	–.85	2.17	1943	
NORTHEAST AND SUPERIOR UPLANDS (9)								
Pleistocene glacial outwash aquifer, at Camp Ripley, near Little Falls, Minnesota	●	59	14.22	1.30	–.15	.42	1949	
Glacial outwash sand aquifer at Oxford, Maine	○	39	8.53	.69	–.06	.21	1980	
Shallow sand aquifer (glacial deposits), Acton, Massachusetts	●	34	19.60	.21	.04	–.61	1965	
Pleistocene sand aquifer near Morrisville, Vermont	○	50	19.72	–.46	–.31	–1.97	1966	
ATLANTIC AND GULF COASTAL PLAIN (10)								
Columbia deposits aquifer near Camden, Delaware	○	11	8.98	–1.39	–.45	.02	1950	
Memphis sand aquifer near Memphis, Tennessee	■	384	107.20	–15.88	.15	.64	1940	
Eutaw aquifer in the City of Montgomery, Alabama	■	270	26.5	–2.9	–1.2	.6	1952	
Evangeline aquifer at Houston, Texas	■	1,152	298.52	6.11	.44	15.31	1978	
SOUTHEAST COASTAL PLAIN (11)								
Upper Floridan aquifer on Cockspur Island, Savannah area, Georgia	■	348	34.65	–6.29	.51	3.45	1956	
Upper Floridan aquifer, Jacksonville, Florida	■	905	–23.2	–5.1	–.2	3.6	1930	
Biscayne aquifer near Homestead, Florida	○	20	6.89	.23	–1.03	.03	1932	

Levels were at or above long-term average in Michigan, mixed with respect to average in Iowa and Illinois, and below average elsewhere. November highs occurred in wells in Iowa, Illinois, and Michigan. November lows occurred in two wells in Ohio and an all-time low occurred in the well in the Cambrian-Ordovician aquifer at Mt. Vernon, Iowa.

Ground-water levels in the Piedmont and Blue Ridge region were above last month's levels in Maryland, mixed in Pennsylvania and Virginia, and below last month's levels elsewhere. Levels were below long-term averages in New Jersey, Maryland, and Georgia, above long-term averages in North Carolina, and mixed elsewhere in the region. November lows occurred in wells in New Jersey and Virginia.

In the Northeast and Superior Uplands region, levels were at or below last month's in Minnesota, Maine, Vermont, and Massachusetts, mixed in New Hampshire, and above last

Provisional data; subject to revision

NEW EXTREMES DURING NOVEMBER AT GROUND-WATER INDEX STATIONS

WRD Station Identification Number	GROUND-WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well	Years of record	End-of-month water level in feet below land surface datum: Previous November Record: Average	Extreme (year)	November 1991
	LOW WATER LEVELS						
	WESTERN MOUNTAIN RANGES						
463906112043901	Cretaceous aquifer near Helena, Montana	○	110	15	27.93	32.85 (1988)	36.28
	ALLUVIAL BASINS						
324340104231701	Roswell Basin shallow aquifer at Dayton, New Mexico	●	250	40	90.68	122.68 (1990)	123.14
351051106395304	Basin-fill aquifer at Albuquerque, New Mexico	●	980	8	31.42	33.06 (1988)	37.17
361611115151301	Valley fill aquifer near Las Vegas, Nevada	■	905	45	32.20	95.20 (1990)	96.84
382444121123301	Mehrten aquifer near Wilton, California	■	300	4	133.22	136.95 (1990)	138.88
403803111505301	Basin fill aquifer near Holladay, Utah	■	165	12	65.26	81.18 (1990)	82.74
	COLUMBIA LAVA PLATEAU						
423659114111601	Snake River Plain aquifer near Eden, Idaho	●	208	29	116.7	123.7 (1981)	126.3
424953113412801	Snake River Plain aquifer near Rupert, Idaho	●	194	41	150.1	158.9 (1990)	160.8
453934118491701	Columbia River basalts aquifer at Pendleton, Oregon	◉	1,501	26	188.67	218.40 (1990)	220.28
474855119303901	Sand aquifer interbedded in Grand Ronde Basalt near Mansfield, Washington	○	60	16	17.21	18.76 (1982)	[1]25.13
	HIGH PLAINS						
341010102240801	Ogallala aquifer near Lubbock, Texas	●	202	40	56.70	90.83 (1990)	[1]92.75
392329101040201	Ogallala aquifer near Colby, Kansas	●	175	44	119.86	129.94 (1990)	131.03
	NONGLACIATED CENTRAL REGION						
375039097234201	Sand and gravel Pleistocene aquifer near Valley Center, Kansas	●	54	54	17.35	20.25 (1956)	21.03
375810097324301	Equus aquifer near Halstead, Kansas	◉	57	52	22.59	36.32 (1990)	40.54
414513077333701	Sandstone aquifer near Gaines, Pennsylvania	○	77	19	33.18	34.01 (1973)	34.28
465755102410701	Sentinel Butte aquifer near Dickinson, North Dakota	○	160	22	18.37	21.00 (1990)	21.67
	GLACIATED CENTRAL REGION						
395118082573300	Glacial drift aquifer near Reese, Ohio	○	53	45	11.87	12.96 (1963/87)	13.42
403207081293800	Glacial-drift aquifer near Dover, Ohio	○	62	31	9.89	12.32 (1988)	12.93
415534091251502	Cambrian-Ordovician aquifer at Mt. Vernon, Iowa	▣	1,557	4	336.82	338.65 (1990)	[1]341.88
	PIEDMONT AND BLUE RIDGE						
385638077220101	Water-table aquifer at Reston, Virginia	○	205	15	14.49	16.03 (1980)	16.90
402644074563601	Stockton aquifer at Sergeantsville, New Jersey	○	21	19	13.43	15.89 (1981)	15.92
	ATLANTIC AND GULF COASTAL PLAIN						
321945090152201	Sparta aquifer system at Jackson, Mississippi	■	852	47	259.80	309.29 (1990)	311.66
322357092341701	Sparta aquifer near Ruston, Louisiana	◉	703	17	223.76	237.12 (1990)	[1]237.45
331438092411901	Sparta aquifer near El Dorado, Arkansas	■	540	36	328.87	354.54 (1990)	371.58
344607091543401	Mississippi Valley alluvial aquifer near Lonoke, Arkansas	●	135	16	107.43	117.75 (1990)	119.51
372506076511703	Upper Potomac aquifer near Toano, Virginia	■	401	5	158.67	162.20 (1990)	[1]163.64
395524074502501	Upper aquifer, Potomac-Raritan-Magothy aquifer system near Medford, New Jersey	■	410	26	113.96	137.74 (1988)	137.93
	HIGH WATER LEVELS						
	ALLUVIAL BASINS						
332615104303601	Roswell Basin artesian aquifer at Roswell, New Mexico	■	324	25	55.70	41.69 (1990)	[2]37.10
452938122254801	Troutdale aquifer near Portland, Oregon	●	715	28	106.53	90.60 (1990)	88.76
	NONGLACIATED CENTRAL REGION						
324842097102901	Twin Mountains (Trinity) aquifer near Hurst/Fort Worth, Texas	●	667	13	462.72	486.15 (1973)	446.31
385604080495901	Upper Pennsylvanian aquifer near Glenville, West Virginia	○	25	38	17.13	18.75 (1953)	13.04
	GLACIATED CENTRAL REGION						
412220089280301	Glacial-drift aquifer at Princeton, Illinois	●	29	49	12.55	6.03 (1967)	5.85
421837094083601	Unconsolidated glacial-drift aquifer near Harcourt, Iowa	◉	42	49	5.55	2.37 (1983)	2.28
442722084350701	Shallow drift aquifer near Roscommon, Michigan	○	14	57	4.86	3.87 (1986)	3.56

[1] All-time month-end low.

[2] All-time month-end high.

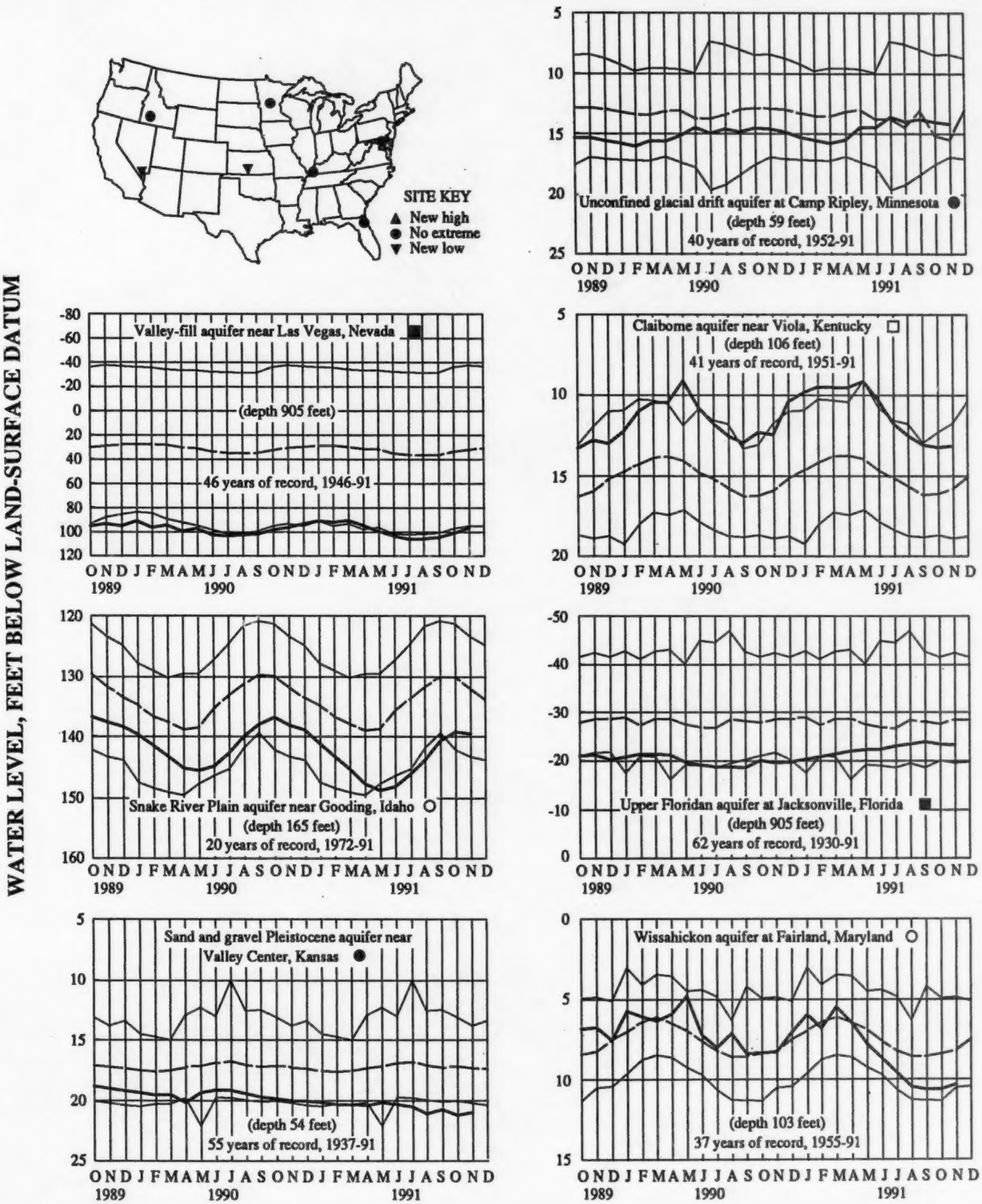
month's levels in Michigan, Connecticut, and New York. Levels were at or below long-term average in Michigan and Vermont and above average elsewhere.

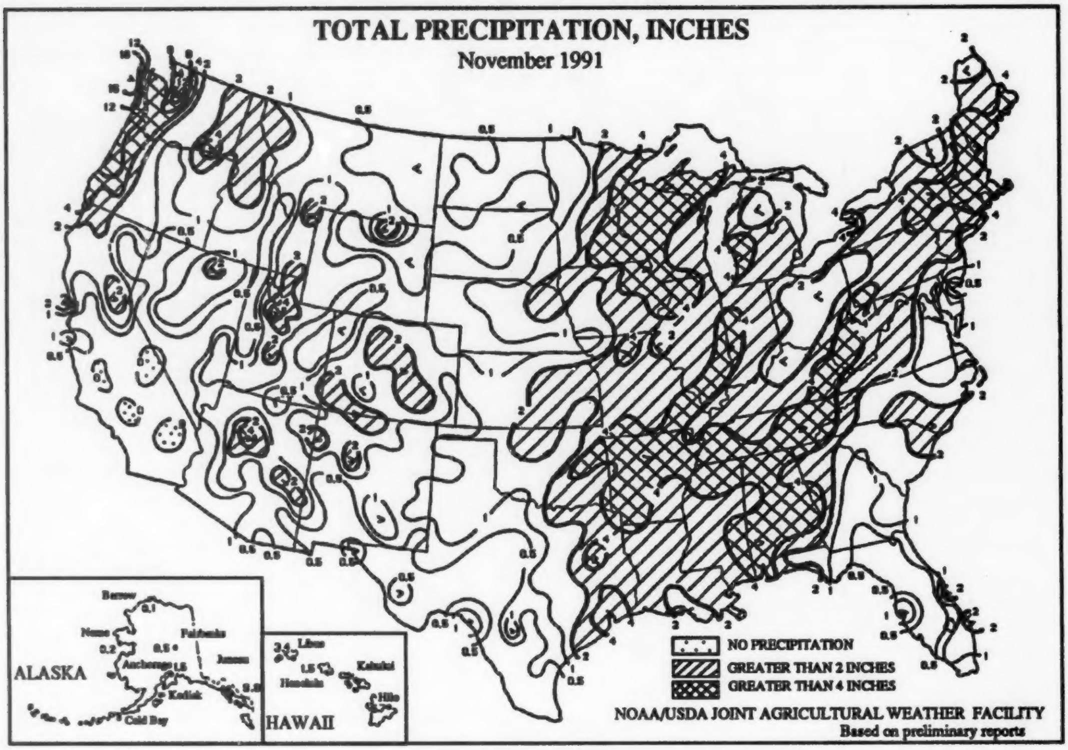
In the Atlantic and Gulf Coastal Plain region, water levels were at or above last month's in Massachusetts, Virginia, South Carolina, Georgia, Mississippi, Tennessee, Kentucky, and Texas, mixed in New Jersey, Arkansas, and Louisiana, and below last month's levels elsewhere. Ground-water levels were above long-term averages in North Carolina, Kentucky, and Texas, and below average elsewhere. November lows occurred in wells in New Jersey, Virginia, Mississippi, Arkansas, and Louisiana. All-time lows occurred in wells in the Upper Potomac aquifer near Toano, Virginia, and in the Sparta aquifer near Ruston, Louisiana.

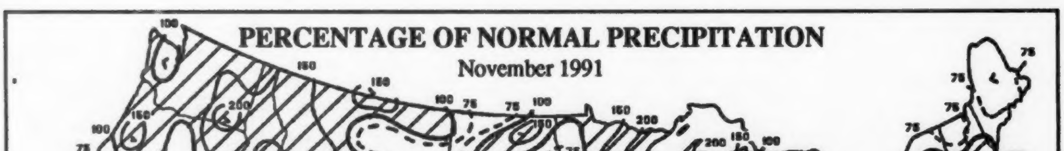
In the Southeast Coastal Plain region, water levels were generally below last month's levels and mixed with respect to long-term average throughout the region.

MONTHEND GROUND-WATER LEVELS IN SELECTED WELLS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.

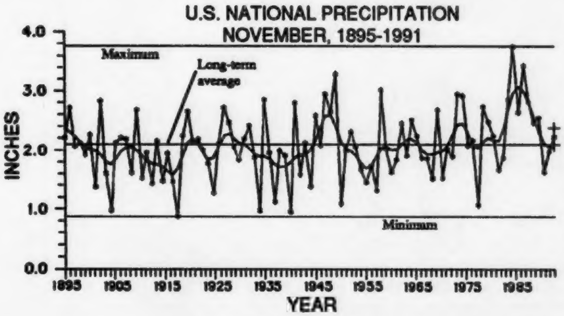






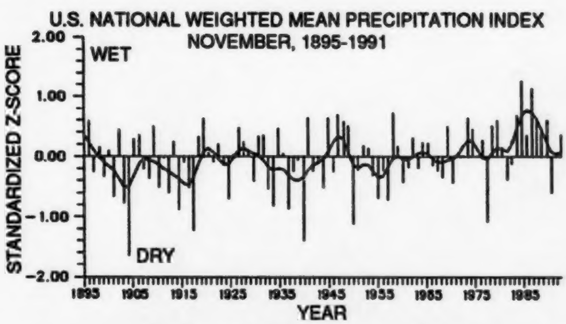
(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Weather Facility)

UNITED STATES NOVEMBER CLIMATE IN HISTORICAL PERSPECTIVE

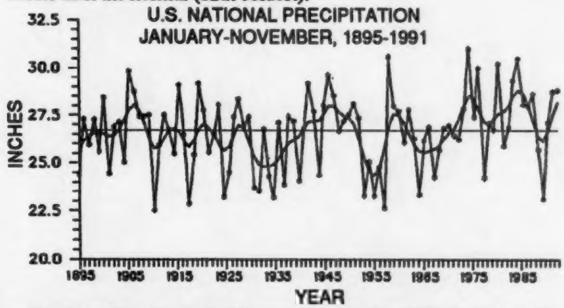


Preliminary data for November 1991 indicate that areally-averaged precipitation for the nation was just above normal for November (graph above), which ranked November 1991 as the 64th driest (34th wettest) November on record. The preliminary value for precipitation is estimated to be accurate to within 0.15 inches and the confidence interval is plotted above as a '+'. About two-tenths (19.1 percent) of the country experienced much wetter than normal conditions and 7.7 percent was much drier than normal.

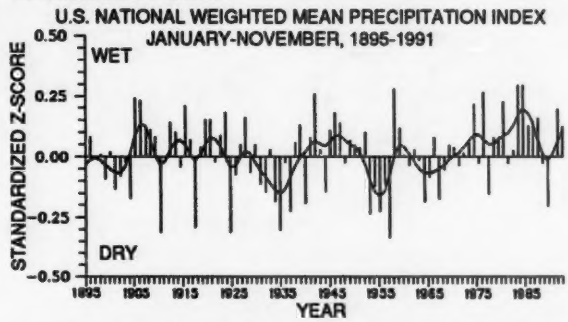
Historical precipitation is shown in a different way below. The November precipitation for each climate division in the contiguous U.S. was first standardized using the gamma distribution over the 1951-80 period. These gamma-standardized values were then weighted by area and averaged to determine a national standardized precipitation value. Negative values are dry, positive are wetter than the mean. This index gives a more accurate indication of how precipitation across the country compares to the local normal climate. The areally-weighted mean standardized national precipitation ranked 1991 as the 25th wettest (73rd driest) November on record.



Temperatures showed a trend towards cooler conditions throughout most of the country with only the Northeast and West regions having temperatures in the upper half of the historical distribution. The East North Central region recorded their eighth coldest November on record and the South region had their sixth coldest November since records began in 1895. The remainder of the country was in the lower third of the historical distribution excepting the Northwest region which had their 42nd coldest November on record. Precipitation rankings varied significantly. The West region recorded their 14th driest November ever while the East North Central region recorded their 2nd wettest November since records began in 1895. The Southwest region recorded significant precipitation giving them their 5th wettest November on record. The remainder of the country was in the middle third of the historical distribution. For the entire nation, November averaged near normal for precipitation (33rd wettest) but temperatures were cooler than the normal (12th coldest).



For the nation, the period January-November 1991 shows areally-averaged precipitation well above normal and comparable to those of the early 1970's. (See graph above.) When the local normal climate is taken into account, however, 1991 ranked as the 22nd wettest January-November period on record (graph below) being only marginally above normal as a whole.

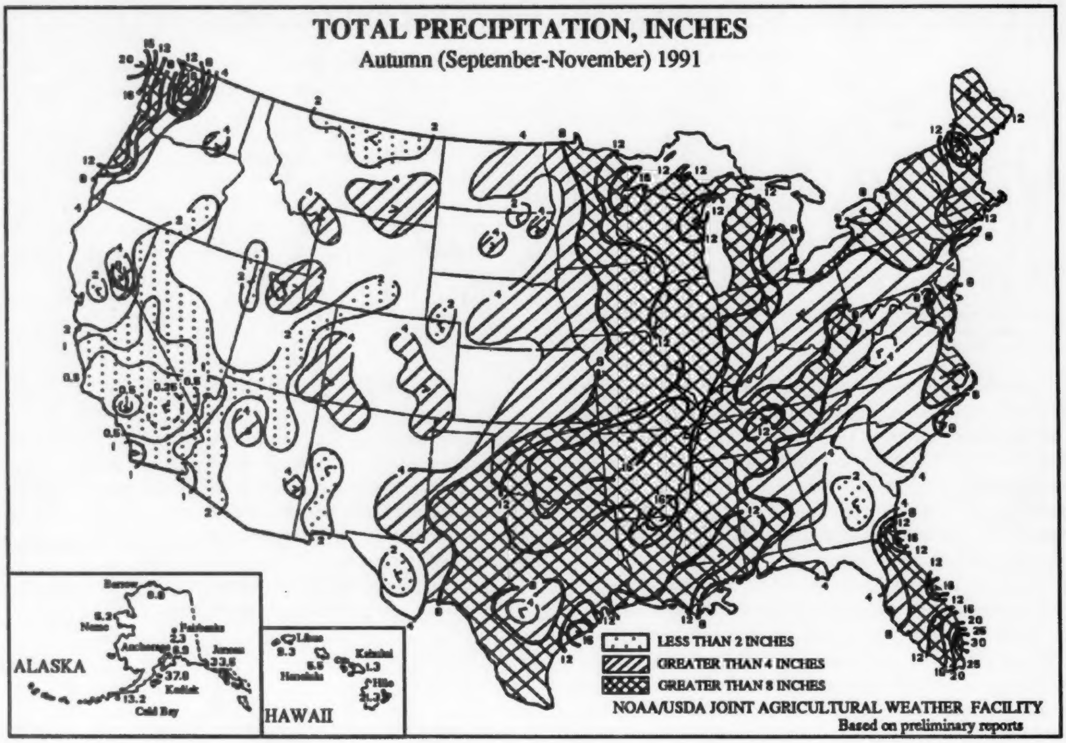


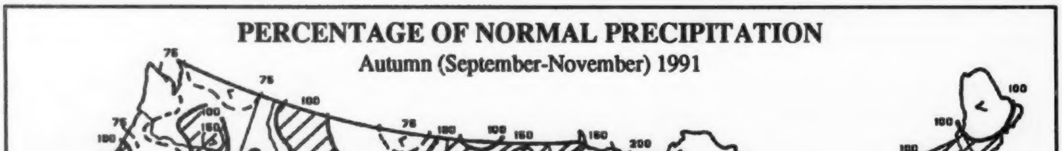
Nationally, long-term drought conditions decreased slightly during November. The percent area of the contiguous U.S. experiencing long-term drought (as defined by the Palmer Drought Index) continues to decrease and is currently about 9 percent). At the same time, the percent area experiencing long-term wet conditions also dropped somewhat but continued to hover around the 6 to 7 percent range.

Only 1.7 percent of the nation suffered from below normal precipitation for the January through November period while 12.1 percent was experiencing much above normal precipitation. For the eleven-month period, January through November, three states (Maryland, Ohio and Pennsylvania) had their seventh driest or drier year while Virginia and West Virginia had their sixteenth and thirteenth driest January through November period on record, respectively. Toward the other extreme, ten states had their tenth wettest or wetter January through November period. Of these, three states had their second wettest January through November period on record and the period for Louisiana is the wettest on record.

Six River Basin areas were in the top third wettest of the distribution for the hydrologic year, now two months old. Topping the list was the Upper Mississippi Basin which had their wettest period on record. The Great Lakes Basin had their 8th wettest period on record while the Upper Colorado Basin had their 9th wettest such period since records began in 1895. On the other hand, the driest was the California River Basin which had their 12th driest such hydrologic period on record.

(From *Climate Variations Bulletin*, National Climatic Data Center, NOAA)

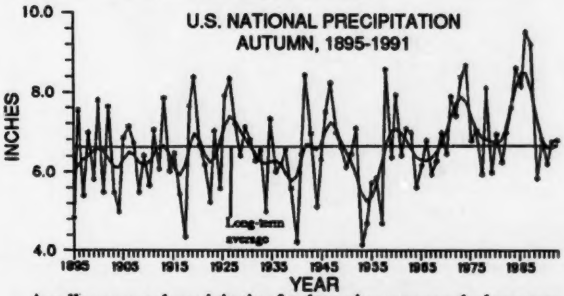




(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Weather Facility)

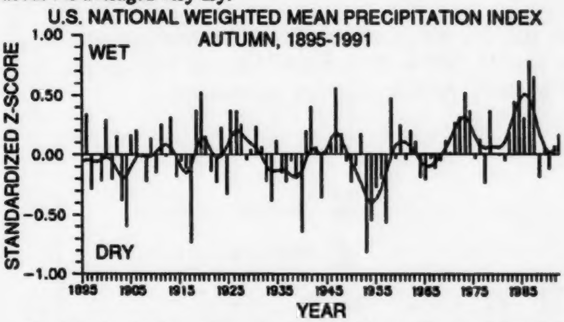
UNITED STATES AUTUMN (SEPTEMBER-NOVEMBER) CLIMATE IN HISTORICAL PERSPECTIVE

Preliminary data for Autumn (September-November) 1991 indicate that temperature averaged across the contiguous United States was below the long-term mean, ranking this autumn as the 26th coldest autumn on record (the record begins in 1895).



Areally-averaged precipitation for the nation was near the long-term mean (graph above), ranking Autumn 1991 as the 53rd driest (45th wettest) autumn on record. Autumn precipitation for the last 5 years has been near or slightly below normal, which is a persistent departure from the unusually wet conditions which prevailed during the first half of the 1980's. According to the graph above, the last 30 years, which have a curious periodicity superimposed on the data (see the filtered curve), have generally been wetter than the previous 60 years.

Historical precipitation is shown in a different way in the graph below. The autumn precipitation for each climate division in the contiguous U.S. was first standardized using the gamma distribution over the 1951-80 period. These gamma-standardized values were then weighted by area and averaged to determine a national standardized precipitation value. Negative values are dry, positive are wetter than the mean. This index gives a more accurate indication of how precipitation across the country compares to the local normal climate. The areally-weighted mean standardized national precipitation ranked 1991 as the 32nd wettest (66th driest) autumn on record. Twelve percent of the nation averaged much wetter than normal during Autumn 1991 while about 7% averaged very dry.



Precipitation had a patchwork pattern, with the Southeast ranking unusually dry and the East North Central region unusually wet. The Southwest region ranked in the wet third of the historical distribution, while next door the West and Northwest regions fell in the dry third of the distribution. The temperature pattern showed cold conditions in the center of the country, warm conditions in the West region, and rankings near the middle third of the distribution elsewhere.

Four states (Iowa, Minnesota, Texas, and Wisconsin) had the tenth coldest, or colder, autumn on record in 1991, while three states (Arizona, California, and Nevada) had the tenth warmest, or warmer, autumn on record. The West region (comprised of California and Nevada) has had warmer than normal autumns for the last five years, which include the warmest (1988) and second warmest (1991) autumns. Autumn temperatures in the East North Central region, which ranked seventh coldest in 1991, have shown a cooling tendency during the last 30 years.

Four states (California, Florida, Georgia, and South Carolina) had the tenth driest, or drier, autumn on record in 1991, and four other states (Illinois, Minnesota, Utah, and Wisconsin) had the tenth wettest, or wetter, autumn on record in 1991. California, which had a 1991 rank of eighth driest, has had near to much below-normal precipitation for the last six autumns. The last two autumns have been very dry.

CLIMATE VARIATIONS BULLETIN EXPLANATION

The *CLIMATE VARIATIONS BULLETIN* is a preliminary report that puts current monthly climate anomalies into historical perspective using climate databases archived at the National Climatic Data Center (NCDC). It is issued on a monthly basis. Supplemental sections are included which address seasonal and annual perspectives, when appropriate.

Current data are based on preliminary reports from First and Second Order airport stations obtained from the National Weather Service (NWS) Climate Analysis Center, and preliminary tornado statistics obtained from the NWS National Severe Storms Forecast Center. **THE CURRENT DATA SHOULD BE USED WITH CAUTION.** These preliminary data are useful for estimating how current anomalies compare to the historical record, however the actual values and rankings for the current year will change as the final data arrive at NCDC and are processed.

The following NCDC datasets are used for the historical data: the climate division drought database (TD-9640), the hurricane datasets (TD-9636 and TD-9697), the tornado dataset (STORM DATA), and the monthly station dataset (LCD supplemental files). It should be noted that the climate division drought database consists of monthly data for 344 climate divisions in the contiguous United States. These divisional values are calculated from the 6000+ station Cooperative Observer network.

The narrative, tables, and graphs in this BULLETIN are also available via automated facsimile. The previous month's summary can be obtained after the tenth of the month by dialing 704-259-0570 (FTS 672-0570) and selecting the appropriate menu codes. A touch-tone fax machine is required.

If you have questions about how the facsimile system works, call 704-259-0756 (FTS 672-0756) and ask for Doug or leave a message on the answering machine.

If you have questions about how to interpret the data graphs in this BULLETIN, call 704-259-0251 (FTS 672-0251) and ask for Richard, or 704-259-0453 (FTS 672-0453) and ask for William.

If you are a researcher and would like to order copies of the historical datasets used to make graphs of the type in this report, call 704-259-0994 (FTS 672-0994) and ask for Tom.

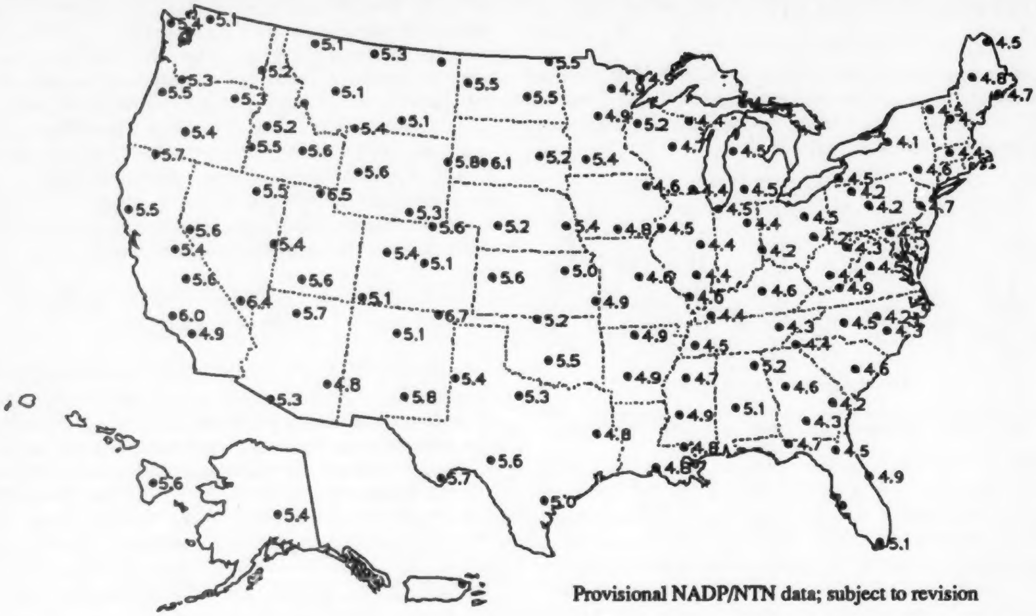
All other questions or requests for data should be made by calling 704-259-0682 (FTS 672-0682) or by writing to:

National Climatic Data Center, NOAA
Mail Stop M2
Federal Building
Asheville, NC 28801

If you use any of the information from this BULLETIN, please identify "National Climatic Data Center, NOAA" as the source.

(From *Climate Variations Bulletin*, National Climatic Data Center, NOAA)

pH of Precipitation for October 21-November 24, 1991

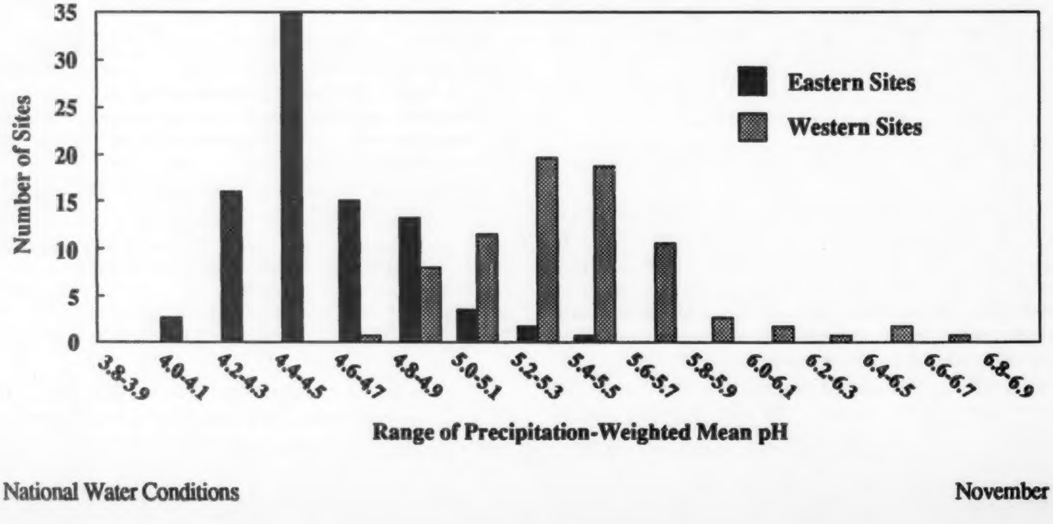


Provisional NADP/NTN data; subject to revision

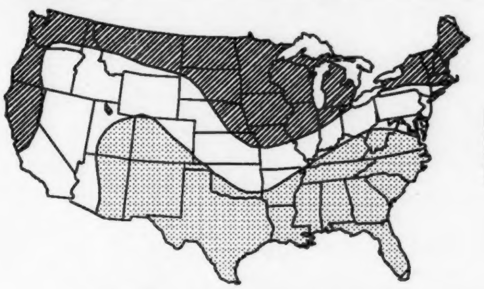
Current pH data shown on the map (• 4.9) are precipitation-weighted means calculated from preliminary laboratory results provided by the NADP/NTN Central Analytical Laboratory at the Illinois State Water Survey and are subject to change. The 128 points (•) shown on this map represent a subset of all sites chosen to provide relatively even geographic spacing. Absence of a pH value at a site indicates either that there was no precipitation or that data for the site did not meet preliminary screening criteria for this provisional report.

A list of the approximately 200 sites comprising the total Network and additional data for the sites are available from the NADP/NTN Coordination Office, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523.

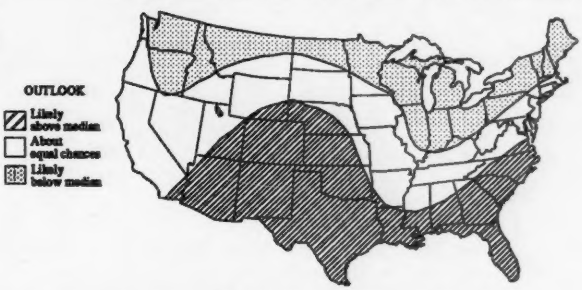
Distribution of precipitation-weighted mean pH for all NADP/NTN sites having one or more weekly samples for October 21-November 24, 1991. The East/West dividing line is at the western borders of Minnesota, Iowa, Missouri, Arkansas, and Louisiana.



TEMPERATURE OUTLOOK FOR DECEMBER 1991-FEBRUARY 1992



PRECIPITATION OUTLOOK FOR DECEMBER 1991-FEBRUARY 1992



From *Monthly and Seasonal Weather Outlook* prepared and published by the National Weather Service

NATIONAL WATER CONDITIONS

NOVEMBER 1991

Based on reports from the Canadian and U.S. Field offices; completed December 30, 1991

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EXPLANATION OF DATA (Revised December 1990)

Cover map shows generalized pattern of streamflow for the month based on provisional data from 186 index gaging stations—18 in Canada, 166 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1951-80. Shorter reference periods are used for one Canadian index station, two Kansas index stations, and the Puerto Rico index stations because of the limited records available.

The ***streamflow ranges map*** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three ***pie charts*** show: the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The ***combination bar/line graph*** shows the percent departure of the total mean from the total median flow (1951-80) and the cumulative departure from median (in cfs) for all reporting stations (excluding eight large river stations indicated by * in the ***Flow of large rivers*** table) in the conterminous United States and southern Canada.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by averaging the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile and median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as: in the ***above-normal range*** if it is greater than the upper quartile, in the ***normal range*** if it is between the upper and lower quartiles, and in the ***below-normal range*** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as ***seasonal*** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as ***contraseasonal*** (opposite to the seasonal change). For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. ***Probability of occurrence*** is the chance that a given flood magnitude will be exceeded in any one year. ***Recurrence interval*** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. ***Recurrence intervals imply no regularity of occurrence***; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about ***ground-water levels*** refer to conditions near the end of the month. The water level in each observation well is compared with average level for the end of the month determined from the entire period of record for that well. ***Changes in ground-water levels***, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for five stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). ***Dissolved solids*** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. ***Dissolved-solids discharge*** represents the total daily amount of dissolved minerals carried by the stream. ***Dissolved-solids concentrations*** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

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